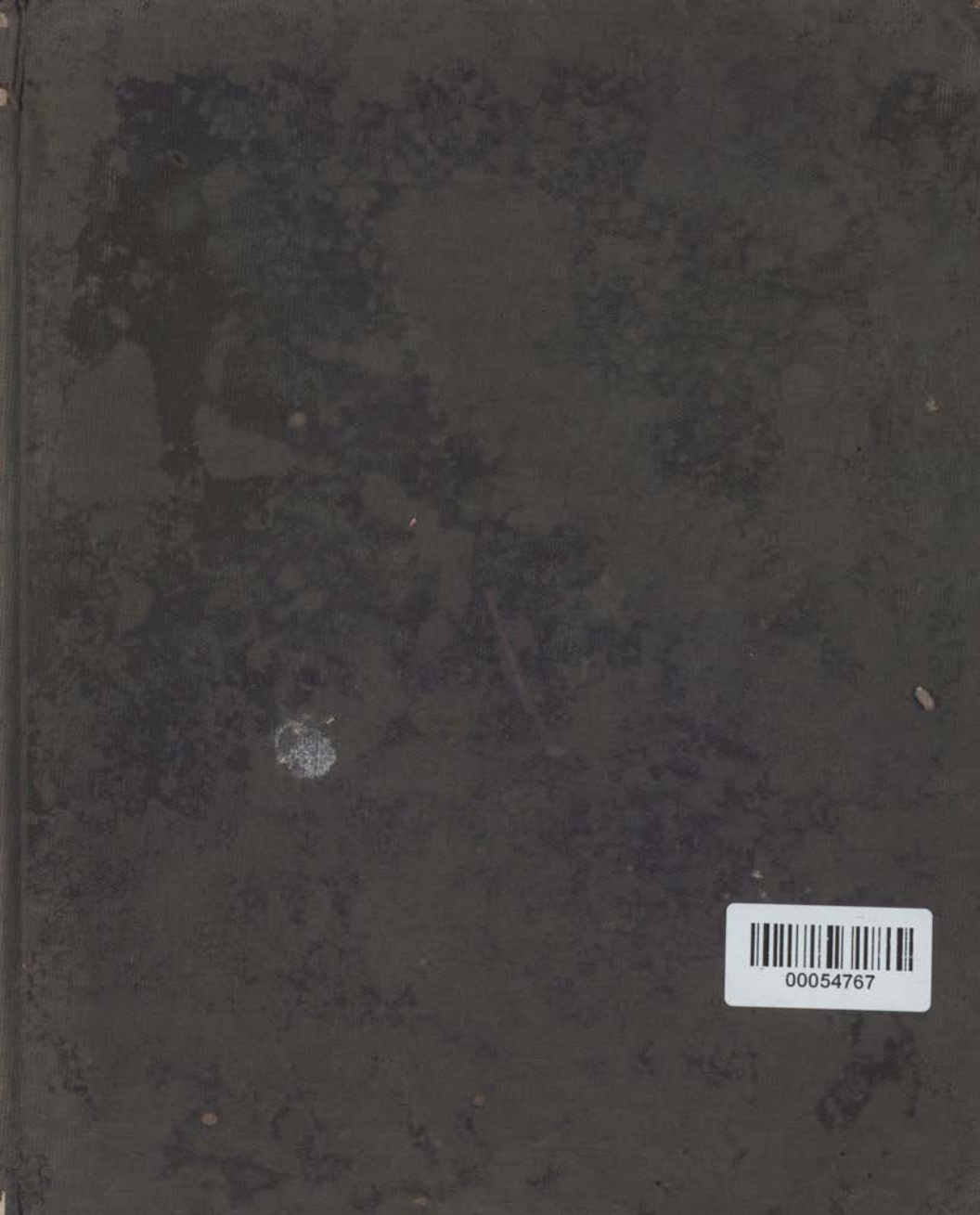
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OF THE
ROYAL ASIATIC SOCIETY.
TOWN HALL, BOMBAY.

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Dillenia pentagyna, Roxb. (page 10.)

FOREST FLORA

OF

THE BOMBAY PRESIDENCY AND SIND.

BY

W. A. TALBOT, F.L.S.,

CONSERVATOR OF FORESTS.

54767

VOL. I.

LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC

RANUNCULACEÆ TO ROSACEÆ.

ILLUSTRATED.

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PREFACE.

The extensive provinces of North-West and Central India as well as the Madras Presidency and Burmah have now for many years been in possession of handbooks or floras describing in detail the elements of their indigenous arborescent vegetation, whereas the Bombay presidency which contains within its limits a large proportion of the Western peninsular forest region and some of the most valuable woodland areas in British India has up to now been without any similar local guide. The present work will it is hoped help to fill this gap in forest literature and by supplying a long felt want indirectly in a measure help on and assist the progress of good forest administration. The opinion is sometimes expressed that local floras should be in the form of small compact handbooks suitable for carrying in the pocket for use in the field. Experience has however proved that these guides are not of much practical assistance to the ordinary student and can generally only be used by experts in systematic botany. As a matter of fact such guides or floras, owing to the difficulty found in identifying species by their aid, only serve to repel and discourage the ordinary inquirer. There can be little doubt that real knowledge of forest or other plants must be gained by a careful study and examination of freshly collected material or herbarium specimens indoors with the conveniences of books and means for the dissection of flowers and fruits conveniently at hand. The size of the present flora has been kept as small as possible and it should not prove too unwieldy for transport in the baggage of any forest or other district officer interested in the subject. The addition of a large number of illustrations of the plants described has no doubt added to the cost of publication and to the bulk of the volumes but it is hoped that these disadvantages will be more than compensated by the increased facility for identifying species. Most of the plates are done from original drawings of freshly collected plants and are often better representations of the natural form of the growing plants than those from dried herbarium specimens.

Since The List of the Trees, Shrubs and Woody-Climbers of the Bombay Presidency was published in 1902 of which this Flora may be considered a more complete edition the following works on Indian systematic, economic, and geographical botany have appeared:—

Flora of the Bombay Presidency by Dr. T. Cooke.
The 2nd edition of Indian Timbers by J. S. Gamble.
Indian Trees by Sir D. Brandis.
The Commercial Products of India by Sir George Watt.
Plant Geography by A. F. W. Schimper.

All these as well as many minor articles in the various reviews and journals have considerably added to our knowledge of the Bombay Presidency Forest Flora. Few new species of trees or shrubs have however been noted by the above mentioned authors from the Western peninsula and the number of trees and shrubs is practically the same as it was in 1902.

With reference to the names of genera and species, Sir Joseph Hooker's Flora of British India has been followed except in a few instances where it was clearly manifest a change was unavoidable. The substitution of the generic names *Tarenna* and *Mitragyna* for the well known and long established *Webera* and *Stephegyne* and several other changes in nomenclature made by Dr. T. Cooke in his excellent Flora of the Bombay Presidency have not been adopted in order to prevent confusion and inconvenience in a work which is primarly intended for practical men. The following Floras as well as Gamble's Manual of Indian Timbers have been regularly quoted:—

1. Flora of British India by Sir J. D. Hooker.
2. The Flora Sylvatica of the Madras Presidency by Col. Beddome.
3. The Forest Flora of the North-West Provinces and Central India by Sir D. Brandis.
4. The Flora of the Bombay Presidency by Dr. T. Cooke.
5. The Bombay Flora by Dalzell and Gibson.

The author takes the present opportunity of expressing his grateful thanks to his sister Miss E. S. Talbot for the great trouble and labour spent over the drawings from which the book is illustrated, also to the kind friends who have assisted him with advice. The preparation of the plates as well as the printing have been carefully carried out by the Photozinco: Department at Poona and the quality of the work reflects credit on that establishment. In conclusion it is hoped that the confidence of the Bombay Government in entrusting the preparation of the Flora to the author is not misplaced.

Note on the distribution of the Forest Flora in the Bombay Presidency and Sind.

There are 4 distinct and different floras found within the Bombay Presidency and Sind, viz. The evergreen tropical flora of distinct Malay peninsular origin containing the closed rain-forest formation, the mixed deciduous and evergreen Konkan flora and the mixed deciduous Deccan flora consisting respectively of monsoon and thorn-forest formations and the Sind desert flora. The type of all these is distinctly tropical and there are no indigenous species characteristic of the montane Indian regions found within the presidency limits. The mountains of the Sayadris and Khandesh Akrani are with the exception of a few isolated peaks in the Nasik district all under 5000′ high and the average elevation scarcely exceeds 2000′. The Mahableshwar plateau (4500′) capped with laterite and with a heavy annual monsoon rainfall of 350″, also the highest area of considerable extent in the presidency is covered with elfin-wood possessing all the characters of alpine evergreen woodland. The constituent species in these forests are however the same as those found at lower elevations or in the plains which is remarkable as the Nilghiri montane woodland flora further south appears abruptly on the Bababuden hills of Mysore at an elevation scarcely exceeding that of Mahableshwar.

The woodland type of vegetation determined by the amount and distribution of the rainfall and the humidity and movements of the atmosphere is represented by an irregular broad belt of forest, 500 miles long by 60 to 70 miles wide, close to and parallel with the Western peninsular coast-line from Bombay southwards to Kanara. As the rainfall gradually diminishes in amount eastwards the character of the vegetation changes and the forests of the ghâts become drier and more open until woodland almost entirely ceases or is only represented by scattered trees or topes of cultivated species in the great open plains or semidesert regions of the Eastern districts.

The following are the principal climatic woodland formations in the Bombay Presidency and Sind with their respective areas of distribution. The first to be considered is Rain-forest (a term quite recently adopted for evergreen-tropical forest) which consists of lofty virgin primeval jungle, attaining to greatest perfection in the constantly moist regions of Java, Ceylon and the Malay peninsula.

Considerable areas of more or less luxuriant rain-forest under monsoon climatic conditions are found within the limits of this presidency in the Sircy, Siddapore and coast talukas of N. Kanara, which except in the most difficult and inaccessible situations are much cut up by Supari palm and spice gardens. This lucrative form of cultivation conducted at the expense of the forests is responsible for extensive tracts in the N. Kanara district of barren bush-land wholly or partly denuded of tree vegetation. North of Kanara and even as far

For the purposes of this Note a Woodland Formation is understood to be an area of vegetation covered with a community of one or more characteristic ligneous species determined by the climatic conditions (principally the amount of rainfall), the origin of the Flora and the qualities of the soil.

east as the Hangal subdivision of the Dharwar district along the Western ghâts under an annual rainfall of not less than 70", isolated irregularly distributed patches of rain-forest, locally called Kans and Rais are found surrounded by cultivation or monsoon-forest. These are often the mere remnant of larger areas and have in many instances been respected by the natives as the abode of a sylvan deity. Roughly speaking rain-forest does not cover more than 500 square miles in the Bombay presidency.

Rain-forest is essentially a closed ombraphilous woodland formation growing on suitable soil usually moist and rich in humus. There are several tiers of vegetation above the dense undergrowth of evergreen shrubs and seedlings. The first consists of small trees 30′ to 40′ high, the next of trees up to 80′ or 100′ and the upper canopy which contains giant buttressed soft wooded species sometimes attains a height of 150′ and upwards. In rain-forest with its crowded luxuriant vegetation there is an intense and continual struggle for light in a constantly humid atmosphere and no general prolonged cessation of vegetative functions like in the winter of temperate climates or the long hot and dry weather of tropical regions. The trunks and branches of the different storeys of trees serve as supports for the rich growth of herbaceous and woody climbers and as the abode of hosts of Orchids, Ferns, Ficus and other epiphytes. Perhaps the most remarkable characteristic of rain-forest is the varied and rich flora with many genera and species as well as some Natural Orders not found outside its limits. There is little doubt that the Western peninsular rain-forest is a spur of the formation which has its centre and greatest extension in the islands of the Malay archipelago. As we advance further from this centre towards the north along the Bombay coast the number of species diminishes and the general character of the formation changes into monsoon-forest which we have next to consider.

Rain-forest is often found on laterite but prefers soils from disintegrated schists or gneiss, In N. Kanara I have found it near the coast on low level laterite with the thick roots of the trees climbing over the rough rocks and exposed to the atmosphere. Rain-forest is practically absent from the Deccan Trap.

Woodland over considerable areas along the ghâts owing to the pronounced influence of the soil assumes a transitional form between rain and monsoon-forest in which the constituent species belong to one or other of these formations in varying proportions. Examples are found in Kanara on the spurs of the ghâts near the sea-coast whether on granitic, laterite or schistose soils. In the Supa taluka at an elevation of about 3000′, there is transition forest on laterite similar in habit to the shola-forests of the Nilghiris and other southern Indian hills. The forests at Matheran, Sakurpather, Bhimashankar and on the higher Nasik and Satara ghâts are further examples. Finally the stunted elfin-wood on the Mahableshwar laterite can only be considered as an extreme kind of this formation.

Monsoon-forest is found in the Bombay presidency on suitable soils and where the annual rainfall is not less than 40" in amount. The area covered by this formation extends in an irregular belt much interrupted by cultivation, 500 miles long by about 40 miles wide from Bombay to the Bhutkal subdivision of N. Kanara and extends both above and below the ghâts over nearly 6000 square miles of territory; its elements constitute the bulk of the Konkan flora. In this formation the character of the vegetation is altogether regulated by monsoon conditions. The trees are not so high and lofty as in rain-forest and are more or less bare of leaves during the prolonged dry and hot season from November to June. Monsoon-forest is rich in woody climbers and herbaceous epiphytes but poor in woody epiphytes

and is essentially a mixed formation. Although there are dominant species like the Teak, Jamba and Kindal; over large areas it contains no pure forests of one species excepting perhaps Bamboos. Trees in the rain-forest without foliage at stated times are comparatively rare and the phenomena connected with defoliation have not like in the monsoon-forest any connection with the seasonal changes. The finest monsoon-forests in the presidency corresponding favorably with Kurz's lower mixed-forests of Burmah are those of the Yellapore, Halial, Supa and Sircy subdivisions of Kanara; they contain large areas of valuable Teak and Blackwood mixed with other excellent timber trees of large dimension. Monsoon-forest of varying quality is found in the Belgaum, Goa, Sawantwadi, Kolhapore, Satara and Nasik ghâts (Peint,) Kolaba and Tannah. Further north and eastwards this formation gradually changes into bush-wood or thorn-forest.

The next climatic woodland formation covering large areas of peninsular India with a rainfall under 30" and the vegetation bare of leaves throughout the prolonged hot and dry season from November to June is according to the new nomenclature called thorn-forest. In this usually open formation the trees scarcely ever exceed 60' in height and are frequently armed with strong spines or prickles. Slender stemmed woody climbers are fairly common and there is generally an abundant undergrowth of deciduous or evergreen often thorny bush-wood but epiphytes are very poorly represented. During the rainy season grass of poor quality springs up consisting of narrow-leafed *Setaria, Aristida* and other xerophitic species. In consequence of the scanty dry herbaceous undergrowth the seasonal fires do less damage to the growing stock in the forest than usual. The principal trees are mostly thorny *Leguminosæ* more or less mixed with a small number of other armed or unarmed species. Some of the Acacias like the *Babul* and *Kair* also stunted *Teak* are gregarious over considerable tracts of country. The semidesert formation on rocky barren soil which is the usual accompaniment of thorn-forest consists in most parts of arborescent *Euphorbias* or thorny bushwood (thorn-scrub). *Cassia auriculata,* bushes one of the few species not eaten by goats is also common throughout the thorn-forest and semidesert areas of peninsular India.

There are large areas of woodland in the Khandesh districts, the neighbouring Surat Dangs and Nasik district with a rainfall of over thirty and less than forty inches which possess an open park-like appearance, they contain low thick-stemmed generally stunted trees and a rich undergrowth of herbaceous and slender shrubby species mixed with rank *Andropogoneæ* and other tall coarse grasses. These open forests are annually burnt more or less throughout by the recurring hot season fires so that fire resisting species only survive and there is a marked absence of woody or herbaceous climbers and epiphytes. Salai *(Boswellia serrata)*, Mhowra *(Bassia latifolia)* and the Anjan *(Hardwickia binata)* are some of the more common and widely spread trees in this formation. This kind of forest, to which the term savannah-forest may conveniently be applied, should not be confounded with Kurz's formation of the same name which grows on deep alluvial soil along the Irrawaddi and other large rivers in Burmah.

There are no grassland formations strictly speaking within the limits of the Bombay presidency as woodland climatic conditions prevail throughout the entire area. The action of mankind has scarcely affected the struggle between the two types of vegetation except perhaps in the case of some of the abandoned kumri lands on the Kanara and Belgaum ghâts where forest has been replaced by a growth of shrubs and rank grasses. The next leading

type of climatic formation to be noticed covers large areas in Sind in the sandy desert plains away from the fertilizing influence of the river Indus. In this desert formation the struggle for existence is between the vegetation and its hostile surroundings and only plants (shrubs or herbs)provided with special contrivances for retaining water can possibly exist.

The Prosopis-forest formation is however an exception and thrives in Sind on land outside the range of actual inundation of the Indus and this species which possesses an extraordinary long and powerful tap root forms pure forests under climatic desert conditions which no other tree can support.

The minor woodland formations dependent on soil conditions and known as edaphic formations such as river-bank fringing-forest, Mangrove etc. will be referred to in the body of the work.

FOREST FLORA

OF THE

BOMBAY PRESIDENCY AND SIND.

Order I.—RANUNCULACEÆ.

Herbs or tendril climbing shrubs. Leaves opposite in the climbing, woody genera. Flowers regular, cymose, bisexual. Perianth petaloid of 4-5, valvate or slightly induplicate sepals. Petals many or O. Stamens numerous, hypogynous, with free, filiform filaments; anthers terminal, bilocular, cells adnate. Carpels numerous, free, 1-celled; style simple; stigma on the inner side at the top of the style; ovules solitary, anatrope, pendulous; raphe dorsal. Fruit a head of many 1-seeded, plumose achenes.

Terminal leaflet in compound leaves not transformed into a tendril. Petals O... ... 1. Clematis.
Terminal leaflet transformed into a tendril. Petals many, linear, clavate ... ... 2. Naravelia.

1. CLEMATIS.

Climbing woody shrubs. Leaves opposite, usually compound; petioles often twining; stipules absent. Flowers showy, solitary or in axillary or terminal panicled cymes. Sepals 4-8, petaloid, usually valvate. Stamens numerous. Carpels many, each with 1 pendulous ovule. Achenes beaked or each crowned with a long feathery style.

Filaments glabrous.

Connective of anthers not produced.

Leaves large, usually simple; leaflets remotely serrate or entire. Flowers large, purple ....1. C. smilacifolia.
Leaves small, ternate; leaflets entire, 1-3-toothed or lobed ....2. C. triloba.
Leaves pinnate, bipinnate or 2-ternate; leaflets entire or coarsely serrate. Flowers small, white ...3. C. Gouriana.

Connective of anthers produced more or less.
Leaves simply pinnate; leaflets coriaceous, toothed.
Flowers small, yellowish-green ....4. C. hedysarifolia.

Filaments hairy.

Leaves pinnate; leaflets densely villous.
Flowers large, yellow ....5. C. Wightiana.

1. C. smilacifolia, Wall. in Asiat. Researches, XIII. 414; Fl. Br. I. 1, 3; Dalz. & Gibs. Bomb. Fl. 1; Cooke Fl. Pres. Bomb. 1, 2.

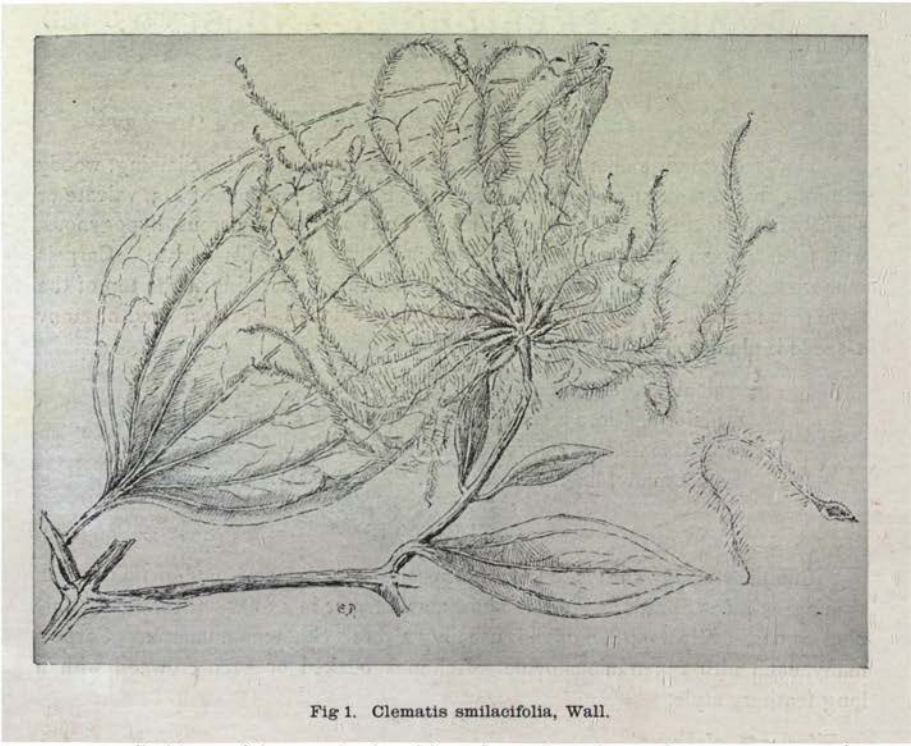


Fig 1. Clematis smilacifolia, Wall.

A climbing, glabrous shrub with sulcate branches. Lower leaves entire, upper sometimes ternate; leaflets coriaceous, ovate, elliptic, acute, entire or remotely serrate, rounded or cuneate at the base, purple beneath, strongly, usually 7-basal nerved; blade 8″-3″ × 6″-2″; petiole sheathing at the base, twining. Flowers 1″-1·5″ in diameter, in long, 6″-12″, axillary panicles; pedicels 1″-3″. Sepals 4-5, thick, brown tomentose outside, inside purple. Filaments linear, inner shorter with longer anthers and somewhat produced connectives. Achenes ovoid, beaked, compressed, thickened on the margins, brown hairy; feathery tails 1·5″ long, covered with white hairs and ending in a curved, clavate tip.

Himalayas from Sikkim eastwards, Malay Archipelago, Java, Borneo and the Philippines, and in the Western Peninsula from the Konkan to Travancore, ascends to 3600′ in the Akrani, (Satpuras), found on the margin of the lake near Tooranmal. A somewhat rare, showy, ornamental species probably of Malayan origin. In N. Kanara it is confined to the moist, evergreen rain-forests of the ghàts and is nowhere common. Fl. Oct. Fr. C.S.

2. C. triloba, Heyne in Roth. Nov. Species 251; Fl. Br. I. 1, 3; Dalz. and Gibs. Bom. Fl. 1; Cooke Fl. Pres. Bomb. 1, 2. *Morbel, Ranjai,* M.

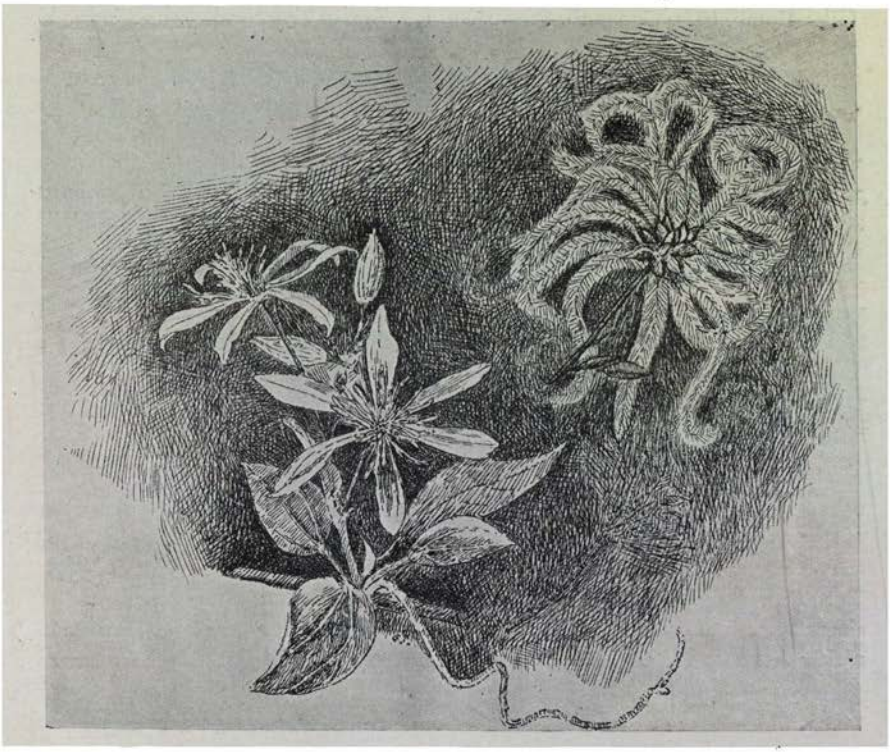


Fig 2. Clematis triloba. Heyne.

A silky tomentose, climbing shrub with round or sulcate branches. Leaves coriaceous, usually once ternate; leaflets small, ovate, acute, entire or more or less deeply 1-3-lobed, base rounded, cordate or cuneate, 3-basal-nerved; blade 2″—·75″ × 2″—·5″; petioles slender, twining, 1″-2″ long. Flowers white, 2″ in diameter, in copious axillary panicles; bracts ovate, villous, leafy, persistent. Sepals 4-6, membranous, veined, obovate, acute, stellately pubescent outside,

glabrous inside. Stamens ·3″ long; filaments ligulate, glabrous; anther-cells as long or longer than the filaments on either side of the often apiculate connective. Achenes ovoid, compressed with thickened margins, straw coloured and silky hairy; feathery tails 1″-1·5″ long, scarcely thickened and less hairy at the tips than in *C. smilacifolia*.

Apparently endemic in the Western peninsula, common throughout the Deccan, particularly in the Poona and Ahmednagar districts on stony, trap hills, usually in open situations. Fl. Sept., Nov. Fr. C. and H. S.

3. C. Gouriana, Roxb. Fl. Ind. Fl. Br. I. 1, 4; Wight Ic. t. 933-4; Dalz. & Gibs. Bomb. Fl. 1; Cooke Fl. Pres. Bom. 1, 2. *Indian Travellers' Joy; Moriel.* M.

Fig 3. Clematis Gouriana, Roxb.

An extensively spreading climber with brown, sulcate, hairy or glabrous stems and branches. Leaves pinnate, bipinnate or twice ternate; leaflets small, ovate or oblong acuminate, coarsely toothed, membranous, shining above, glabrous or pubescent beneath; venation strong, prominent; blade 1″-2″ × ·5″-1″;

petioles long, slender. Flowers small ·4″ across, yellowish or greenish white, in large, dense panicles; peduncles pubescent. Sepals 4, obovate, tomentose. Stamens with glabrous filaments and small terminal anthers without a prolonged or distinct connective. Achenes brown, ovoid, narrow-oblong, hairy; feathery styles clubbed at tips.

Western Himalayas to Ceylon in hilly districts, extends to Java and the Philippines; throughout the Bombay presidency both in the Konkan and Deccan. A conspicuous flowering tendril-climber, common along the banks of rivers and nallahs in many localities, distinguished from other indigenous species by the great panicles of small flowers and in possessing anthers without a distinct connective.

4. C. hedysarifolia, DC. Syst. 1. 148; Fl. Br. I. 1. 4; Cooke Fl. Pres. Bom. 1, 3.

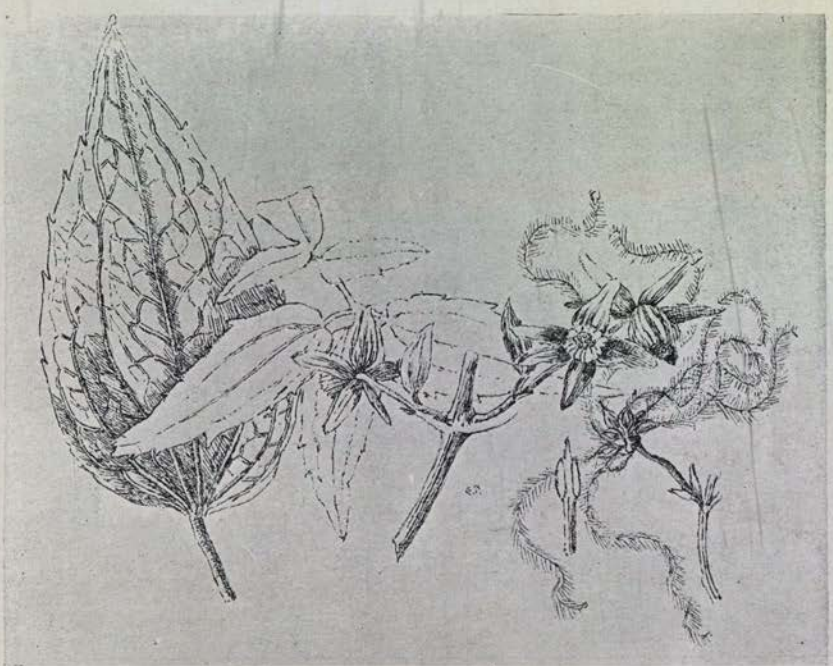


Fig 4. Clematis hedysarifolia, DC.

A woody climber with sulcate, glabrous or sparsely pubescent branches. Leaves simple or pinnate, often trifoliate, very coriaceous, glabrous, shining; leaflets ovate, acuminate, cordate or rounded at the base, entire or variously lobed; venation very strong and prominent; blade 5″-2″ × 2·5″-·75″; petioles

stout, twining. Flowers '75″ across, yellow green, in axillary or terminal, cymose, leafy, bracteate panicles as long as or longer than the leaves. Sepals 4, ovate, tomentose outside, deflexed. Filaments broad, ligulate with long marginal anther-lobes on either side of the prolonged connective. Achenes orange or reddish, glandular hairy with rough, thickened margins; styles with clavate tips, each with a tuft of hairs at its base.

Apparently endemic on the Western ghàts of Bombay, common up to 4500′ altitude; along nallahs and streams in N. 'Kanara and the Konkan. Grows on laterite in the rain-forests near Mahableshwar. Flowers Oct. Nov. Fr. C. and H. seasons.

5. C. Wightiana, Wall. Cat. 4674; Fl. Br. I. 1, 5; Wight's Icones, t. 935; Dalz. & Gibs. Bomb. Fl. 1; Cooke Fl. Pres. Bomb. 1, 3.

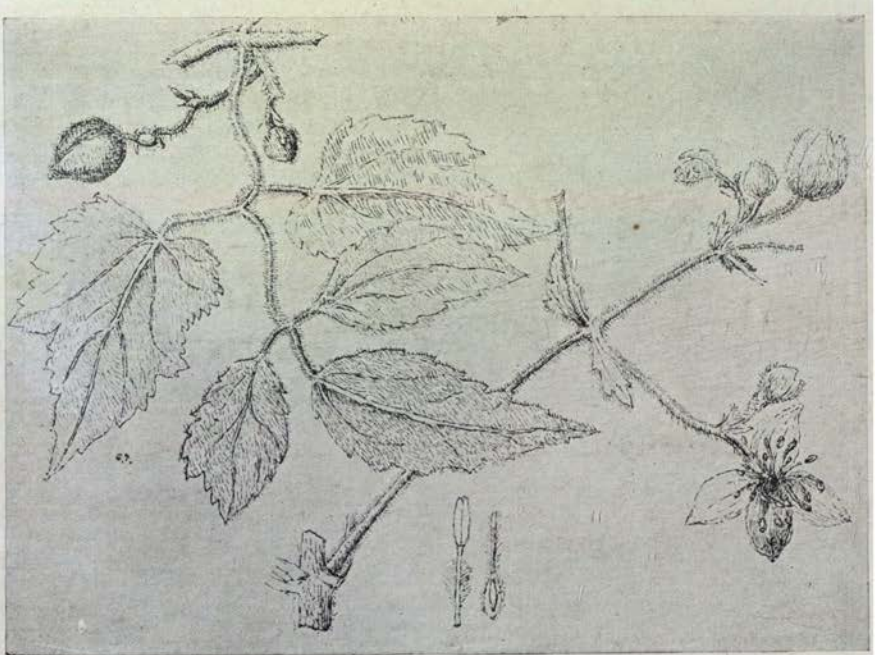


Fig 5. Clematis Wightiana, Wall.

A brown, tomentose, woody climber with sulcate branches. Leaves pinnate; leaflets 3-5, silky brown or grey villous, broadly ovate, cordate, toothed and lobed; blade 2″-1″ × 1·75″-·75″; petioles long, covered with silky hairs. Flowers large, yellow, 2″ in diameter, in decompound, leafy, bracteate

panicles. Sepals 4, silky tomentose outside, glabrous inside. Stamens shorter than sepals; filaments linear, ligulate, silky hairy in the middle, glabrous above and below; anthers short; connective not produced. Achenes ovoid, compressed, densely hairy, with long feathery styles.

2. NARAVELIA, DC.

Climbing shrubs with woody stems. Leaves trifoliate; terminal leaflet usually transformed into a tendril. Flowers in axillary or terminal, spreading panicles. Sepals 4-5. Petals numerous, linear, clavate, longer than the sepals. Carpels many, on a small globose, hairy torus; ovule pendulous. Achenes linear, stalked, with long feathery tails.

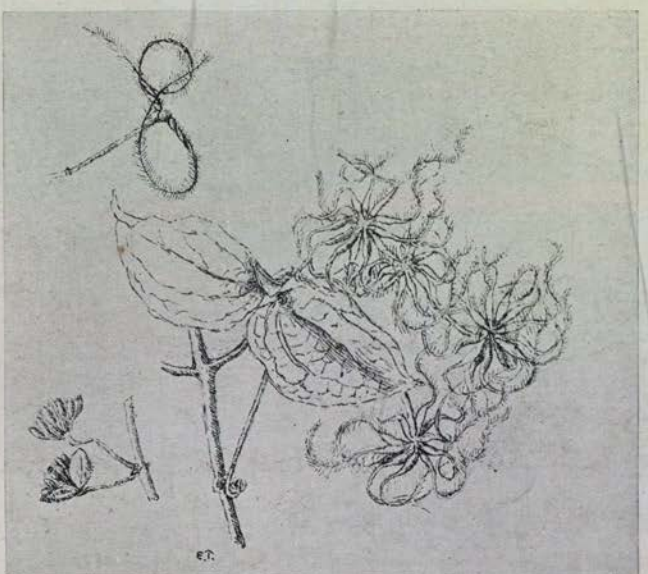


Fig 6. Naravelia zeylanica, DC.

N. zeylanica, DC. Syst. 1, 167; Fl. Br. I. 1, 7; Dalz. & Gibs. Bomb. Fl. 1. Grah. Cat. 1; Trim. Fl. Ceylon 1, 2; Cooke Fl. Pres. Bomb. 1, 4; Watt. Dict. Econ. Prod. 5, 317; *Atragene zeylanica,* Linn. Roxb. Fl. Ind. 2, 670.

More or less pubescent or tomentose. Leaves with 2, opposite leaflets and a terminal stout, 3-branched tendril; leaflets brown tomentose beneath, glabrous above, coriaceous, broadly ovate, acute or acuminate, rounded or cordate at the base, sometimes unequal sided, entire or distantly toothed, 3-5-basal nerved and venation strong beneath; blade 5″-3″ × 4″-2″; petiole long, stout,

woody; petiolules short. Flowers small, ·5″ across. Sepals 4-5, broad ovate, ribbed, caducous. Petals 6-12, linear, spathulate, longer than the sepals. Stamens with short, ligulate, glabrous filaments, lateral anther-cells and a produced connective. Achenes red, ·25″ long, clothed with long, white hairs, spirally twisted and gradually narrowed into long, feathery styles with thickened tips.

Tropical Himalayan forests, eastwards from Nepal. Eastern and Western Peninsulas, Ceylon and Java. Common on the N. Kanara ghâts in some of the deciduous monsoon-forests, extends into the Dharwar and Belgaum districts but apparently has not been observed further north in the Deccan or Konkan. Fl. Oct., Fr. C.S. *Naravelia* is derived from the Sinhalese name *Nara-wel.*

Order II.—DILLENIACEÆ.

Shrubs, herbs or trees with large penniveined leaves, distinctly alternate. Flowers yellow or white, often showy. Sepals 5, imbricate, persistent. Petals 5-4, imbricate, deciduous. Stamens hypogynous, indefinite; anthers introrse,

Fig 7. Dillenia indica, Linn.

dehiscing by lateral slits or by 2 terminal pores. Carpels 1 or more, free or cohering; styles always distinct; ovules amphitropous, solitary or few and ascending or many and attached to the ventral suture. Fruit of follicles or

baccate. Seeds with or without an aril; albumen fleshy; embryo minute next the hilum.

DILLENIA, Linn.

Trees. Leaves serrate. Flowers solitary or fascicled, yellow or white. Sepals 5. Petals 4-5, deciduous. Stamens numerous in many series; anthers linear, dehiscing longitudinally or by terminal pores. Carpels 5-20; styles as many as ovaries. Fruit globose, enclosed in the thickened calyx. Seeds exarillate, naked or immersed in pulp.

Leaves persistent. Flowers large, white .... 1. D. indica.

Leaves deciduous. Flowers much smaller, yellow 2. D. pentagyna.

D. indica, Linn; Fl. Br. I. 1, 36; Brandis For. Fl. 1. *D. speciosa,* Thunb. Dalz. & Gibs. Bomb. Fl. 2; Bedd. Fl. Sylv. t. 103; Gamble. Man. Ind. Timb. 4. *Mota karmal,* M. *Chalta,* H.

A medium-sized or large, evergreen tree with a rounded crown. Leaves large, usually fascicled at the ends of the branches, oblong-lanceolate, sharply serrate, coriaceous, glabrous above, pubescent on the nerves beneath; blade 8″-10″ by 2″-4″; petioles sheathing, 1″-2″ long; lateral nerves rib-like, close set and very prominent. Flowers solitary, white, odorous, sub-terminal, about 6″ in diameter. Sepals concave, thick, fleshy; margins thin, membranous. Petals obovate-oblong. Outer stamens erect, inner recurved, arching over the outer. Ovaries 20. Fruit large, 3″-4″ in diameter, hard outside, fleshy within. Seeds compressed, immersed in glutinous pulp; margins hairy.

Himalayas from Nepal to Assam. Southern, Eastern and Western Peninsulas, extends to Ceylon, Burma and the Malay Archipelago. Planted in various parts of India. Konkan (Savantwadi); Kolaba (Alibag); Belgaum, I have only seen planted specimens of this species which is cultivated for its ornamental flowers and fine foliage. Fl. June, Fr. Feb.

A medium-sized or large tree with a short, thick trunk. Bark ·25″ thick, grey, rough, shining and scaly outside, brown within. Wood red with white specks, close-grained, moderately hard and tough, durable. Weighs 44 lbs. per cubic foot. If continuously kept under water turns jet black and lasts for years. Used for gun-stocks, firewood and charcoal. Ripe fruit eaten in native curries. Leaves used to polish ivory.

2. D. pentagyna, Roxb. Cor. Pl. 1. t. 20; Fl. Br. I. 1, 38; Brandis For. Fl. 2; Bedd. Fl. Sylv. t. 104; Dalz. & Gibs. Bom. Fl. 2; Gamble Man. Ind. Timb. 6. *Karmal, karambel, kurweil,* M.; *Kanagola,* K.

A moderate sized, deciduous, white barked tree. Leaves aggregated at the ends of the branches, large, oblong, lanceolate, strongly parallel-ribbed, serrate; blade 1′-2′ long by 1′ broad; petioles short, stout, sheathing. Flowers ¾″ acrosss, cented, fascicled on the naked branches on raised tubercles, without bracteoles, about 7 together; pedicels 1″-2″ long, puberulous when young or glabrous when old. Calyx of 5, thick, pubescent, green, imbricating sepals, accrescent in fruit. Petals 5, thin, yellow, unguiculate. Stamens many, free; inner erect; outer longer, spreading. Carpels cohering; styles 5, recurved, glabrous. Fruit covered with the accrescent calyx-lobes, size of a goose-berry, yellow when ripe; seeds exarillate.

Oudh, Bengal, Assam, Burma, Central, Southern and Western India, absent from Ceylon. Throughout the Bombay Presidency in deciduous monsoon-forests; usually found stunted and of medium size in the dry, open forests of Guzerat, Khandesh and other Deccan districts; also occurs in the mixed forests of N. Kanara where it attains considerable dimensions under the more favourable climatic conditions which prevail in that part of the Western peninsula. Fl. March-April. Fr. May.

Bark ·5″ thick, grey, scaly, shining on the young branches; on quick-growing trees scarcely any rhytidome, except a little at the base of the stem. Green cells well developed. Inner bark: large patches of soft, white bast mixed with bands and irregular patches of darker coloured tissue. Sapwood white. Heart-wood reddish grey, strong, heavy, handsomely marked on a vertical section by the moderately broad and fine medullary rays. Pores small and moderate-sized; some filled with a white substance, visible on both horizontal and vertical sections, forming a characteristic of the wood. Annual rings distinct. Weighs about 45 lbs. to the cub. ft. Furnishes a favourite firewood in North Kanara as it splits easily but is not however used for construction purposes, it also makes good charcoal. Leaves lopped for leaf manure; they are used in the Poona ghàt villages as a substratum for thatched roofs. "Flower buds and young fruit have a pleasant acid taste and are eaten raw or cooked in the Central Provinces and Oudh" Brandis.

Order III.—MAGNOLIACEÆ.

Erect trees or shrubs, sometimes climbing, often aromatic, with convulute, deciduous stipules and alternate leaves. Flowers usually bisexual, axillary or terminal, often large and showy. Sepals and petals usually similar, trimerous, imbricated. Stamens many, free, inserted on the torus; anthers basifixed, cells adnate, longitudinally dehiscent. Ovaries numerous, often spirally arranged on the torus. Seeds albuminous; embryo minute; cotyledons spreading.

MICHELIA, LINN.

TREES. Leaves simple, alternate, shining. Flowers large. Sepals and petals similar, concolorous in 2-7 whorls of 3, imbricate, deciduous Stamens

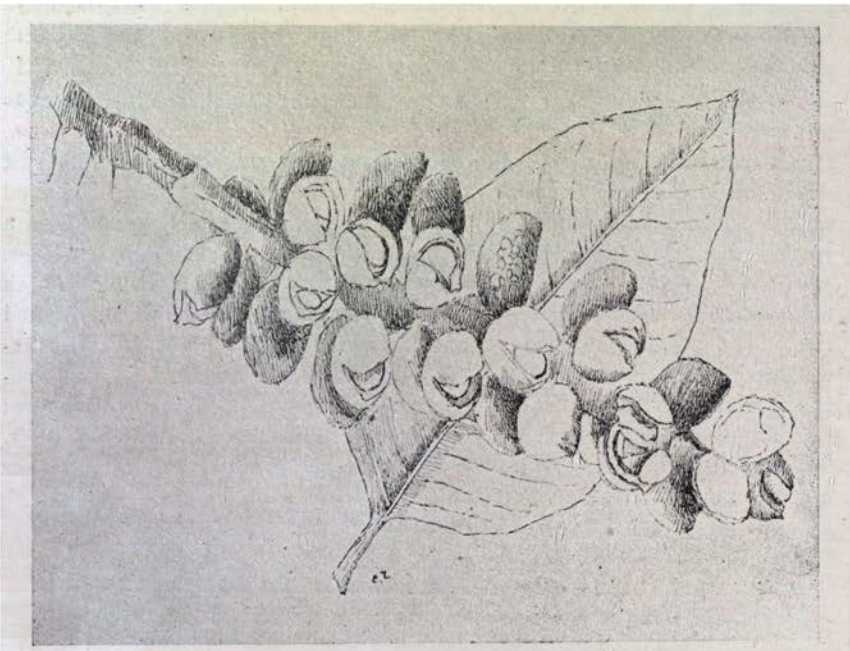


Fig 8. Michelia Champaca, Linn.

numerous, free; filaments flat. Gynophore stalked. Carpels numerous, each with 3 or more ovules. Fruit a spike of 2-valved, 1-12 seeded, dehiscent carpels. Seeds albuminous with a fleshy testa, pendulous on a long funicle.

M. Champaca, Linn. Sp. Pl. 536; Fl. Br. I. 1, 42; Brandis For. Fl. 3; Gamble Ind. Timb. 2; *Kud Champa,* M.; *Kola sampige* K.; *Champa* Vern; *Rae champo, champo,* Guz.

A large, evergreen tree. Leaves ovate, lanceolate, acuminate, shining above, pubescent beneath when young, afterwards glabrate; blade 8″-10″ by 2·5″-4″; petiole 1·5″-2″ long. Flowers axillary, yellow, fragrant, 2″ in diameter; buds silky. Segments of perianth 15-20. Fruit carpels thick, flattened, grey, sessile, ovoid, covered with white raised, rough dots; seeds angular, black or brown, pitted; testa (arillus) pink, fleshy; funicle of several elastic, white hairs.

Nepal, Assam, Burmah and the Nilghiris, Western ghâts. A handsome, evergreen tree with a cylindrical stem (3′-4′ in diameter); sometimes attaining large dimensions of height and girth; (Beddome measured a tree on the Balarangam Hills in Mysore which had a circumference of more than 50′); common in many of the Sircy and Siddapur taluka evergreen rain-forests of N. Kanara. It is widely cultivated for ornament and on account of the flowers near Jain and Hindu temples throughout India. In some of the N. Kanara "Kans" the stems are evidently garden-escapes but in others there is every appearance of the tree being indigenous. Flowers at various seasons. Ripe fruit in the cold season.

Bark grey, smooth, ·5″ thick. Wood olive-brown, soft and durable, contains a bitter deliquescent salt which prevents rot. Pores small, equally distributed. Med. rays moderately broad, short and wavy. Weighs 33 lbs. to the cubic foot. Seasons well and takes a good polish. Used for planking, house-building and furniture. The scented flowers are used as an offering in the religious ceremonies of Hindu temples. Bark, fruit, flowers and leaves are employed in native medicine. The flowers yield a yellow dye. "The wood is made into beads, and necklaces of the beads are sold to pilgrims at Hardwar." Gamble.

Order IV.—ANONACEÆ.

Trees or sometimes climbing shrubs, often aromatic. Leaves alternate, entire, exstipulate. Flowers bisexual, rarely unisexual. Sepals and petals thick, trimerous, usually valvate. Stamens many, hypogynous, closely packed on the torus; filaments short or O; anthers 2-celled, cells dehiscing by a longitudinal slit; connective produced into an oblong, dilated or truncate head. Ovaries numerous, rarely solitary, free, (in Anona connate); styles short or stigmas sessile; ovules 1 or more in each cell. Carpels 1 or more, sessile or stalked; 1 or more seeded. Seeds large; albumen ruminate, often divided almost to the axis into series of horizontal plates; embryo small; cotyledons divaricating.

The Anonaceæ constitute a very "natural" Order of tropical, woody plants which as far as the indigenous Western peninsular species are concerned, appears to be of Malayan origin. The Order is allied to the Myristicaceæ, Magnoliaceæ, Dilleniaceæ and Menispermaceæ. The peculiar plate-like arrangement of the ruminated albumen and the cross-barred structure of the wood are unmistakable characteristics of the Order.

Anther-cells concealed by the overlapping or produced connectives.

Petals 2-seriate, imbricate in bud. Ovaries indefinite; ovules many, 2-seriate ... ... 1. Uvaria.

Petals valvate in bud, inner subsimilar or O.

Ovaries many, 2-ovuled; peduncles woody, hooked ... ... 2. Artabotrys.

Ovaries numerous; ovules 2-6, 1-seriate on the ventral suture ... ... 3. Unona.

Ovaries many; ovules 1-2, basal ... ... 4. Polyalthia.

Petals 2-seriate, valvate in bud, inner dissimilar, conniving and arching over the stamens. 5. Goniothalamus.

Petals valvate in bud, inner similar but smaller. 6. Anona.

Anther-cells not concealed by the connectives.

Petals valvate, inner largest. Ovules indefinite 7. Saccopetalum.

Petals valvate, inner shortest. Ovules 2-4 .... 8. Orophea.

Petals imbricate, subequal. Ovules 2-8 ... 9. Sageræa.

1. UVARIA, L.

Scandent shrubs. Leaves simple, stellately tomentose or glabrous. Flowers terminal or leaf-opposed, cymose, fascicled or solitary, yellow, purple or brown. Sepals 3, valvate. Petals 6, orbicular, spreading, in 2 rows. Stamens indefinite; connective foliaceous or truncate, dilated. Torus flat, pubescent. Ovaries indefinite, linear-oblong, ovules many, 2-seriate. Ripe carpels many, few, or 1-seeded by abortion.

Carpels small. Seeds in a single row. Peduncles slender	... 1. U Narum.
Carpels larger. Seeds in a double row. Peduncles thick, angular	... 2. U. Hookeri.

1. U. Narum, Wall, Cat. 6473; Fl. Br. I. 1, 50; King Ann. Calcutta, Bot. Gard. 4, 27; Cooke Fl. Pres. Bomb. 1, 9; *U. lurida*, Dalz. & Gibs. Bomb.; Fl. 3. (not of Fl. Br. I.); *Narum panel*, Rheede Hort. Mal. 2, t. 10.

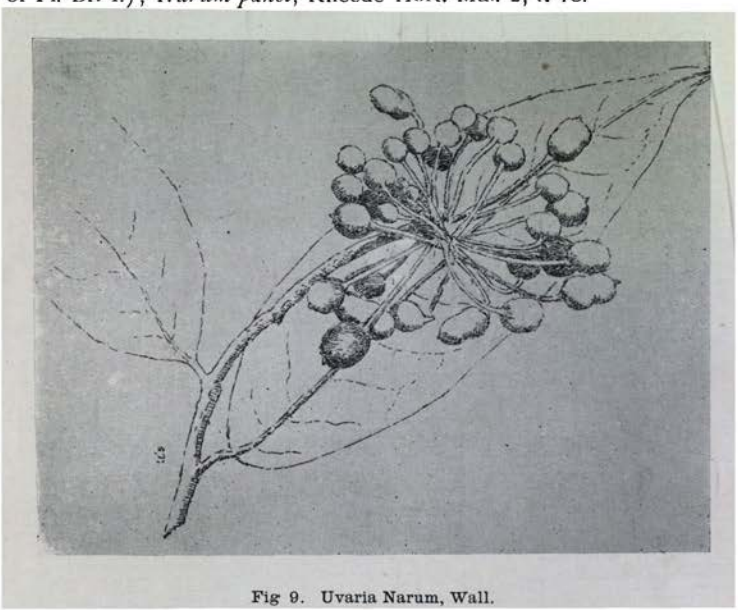


Fig 9. Uvaria Narum, Wall.

A large, woody climber; all parts glabrous except the inflorescence. Leaves oblong-lanceolate, acute, glabrous, shining above; blade 3″-6″ by 1″-2″; petiole ·15″-·25″long; nerves 8-10 pairs, rather faint. Flowers terminal, brownish-red, 1″-1·5″ across; buds depressed, globose, tomentose; peduncles 1″-1·5″ long, slender, glabrous. Sepals orbicular, small. Corolla rosaceous; petals 7-8, ovate, connate below. Stamens indefinite; connective produced, with a broad truncate apex. Carpels

numerous, mostly 1-seeded, slightly torulose, scarlet, ·3″-·5″ long, ·2″-·4′ in diameter, on slender 1″-2″ long pedicels. Seeds light brown, smooth, ovoid or planoconvex.

Western Peninsula on the ghàts from the Konkan southwards; Ceylon up to 4000′ in the Central Provinces. In the evergreen rain-forests of N. Kanara but nowhere common, is locally abundant in the forests of the Kumta taluka near Katgal. A greenish, odorous oil, used in native medicine, is obtained from the roots.

2. U. Hookeri, King. Ann. Calcutta Bot. Gard. 28;

Fig 10. Uvaria Hookeri, King.

U. Narum, Wall. Var. *macrophylla,* Fl. Br. I. 1, 50; Dalz. & Gibs. Bo. Fl. 3; Cooke Fl. Pres. Bomb. 1, 9.

A large climber. Leaves ovate-lanceolate, acute or long acuminate; margins repand, thickened; blade, 6″-9″ by 1.5″-2.20″. Flowers similar but larger (2″ across)

than those of *U. Narum*. Carpels sausage-shaped, 1″-2″ long, much larger than those of *U. Narum* and on thicker 1·5″-3″ long, angular pedicels. Seeds in 2 rows of about 6 each. This species is united in the Fl. Br. I. with *U. Narum*, Wall, as *Var. macrophylla,* but Sir G. King in his 'Anonaceæ of British India' considers it to be distinct and has named it *U. Hookeri.* Common in some of the evergreen rain-forests of the N. Kanara, Konkan and Belgaum Ghâts. Fl. Fr. March-May.

2. ARTABOTRYS, R. BROWN.

Scandent shrubs. Leaves shining, evergreen. Flowers large, solitary or fascicled on woody, hooked peduncles. Sepals 3, valvate. Petals 6, 2-seriate;

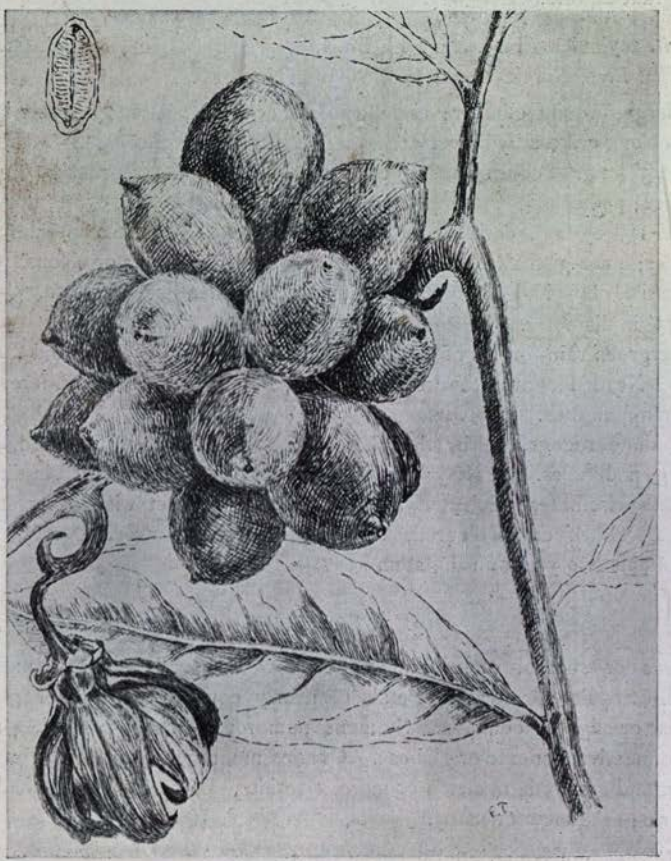


Fig 11. Artabotrys odoratissimus, R. Br.

bases concave, connivent; limb spreading. Stamens numerous; connective truncate-dilated, produced beyond the anther-cells. Torus plano-convex. Ovaries few or many; style oblong or columnar; ovules 2 in each, erect. Fruit a berry.

Flowers and fruit glabrous	...	...	1. A. odoratissimus.
Flowers and fruit tomentose	...	...	2. A. zeylanicus.

1. *A. odoratissimus,* R. Br. in Bot. Reg. 423; Fl. Br. I. 1, 54; Kz. For. Fl. Burm. 1, 31.

Cultivated, but not indigenous, in the Bombay Presidency. Produces large and fragrant flowers.

2. A. zeylanicus, H. f. & T. Fl. Br. I. 1, 54; Bedd. Ic. Pl. Ind. Or. t. 48; Cooke. Fl. Pres. Bomb. 1, 10; Gamble Ind. Timb. 16.

A large, woody climber; branches dark coloured, soon glabrous. Leaves elliptic-oblong or broadly lanceolate, acute, coriaceous, glabrous, 4″-6″ by 1·5″-2″; petiole ·25″ long. Peduncles leaf opposed. Flowers solitary or fascicled, brown, tomentose; pedicels ·5″ long, pubescent. Sepals ·25″ broad, ovate, puberulous, Petals 1″-1·5″ by ·25″, coriaceous (above the basal-sac), densely tomentose on both sides; inner 3 smaller. Anthers sessile. Ovary glabrous or villous. Carpels 7-10, sessile, obovoid, acutely mucronate at top, tomentose, rugulose, ·5″-1″ long by ·5″-·75″ in diameter.

Evergreen rain-forests of the W. Peninsula; also in Central and Southern Ceylon. North Kanara, towards the south, abundant in the rain-forests near the Gairsoppah falls. Fl. Nov.

At once recognised by the characteristically hooked, flattened, woody, flowering peduncles. A lofty climber with compressed stems 3″ in diameter; branchlets circinate, thickened at the points of contact with other stems or branches. Bark dark-coloured, smooth; inner bark reddish, very fibrous. Fruit remains two years on the stem.

3. UNONA, L.

Trees or shrubs, often climbing. Flowers usually solitary, axillary or terminal. Sepals 3, valvate. Petals 6, nearly equal, or the inner 3 absent. Torus flat or slightly concave. Stamens numerous, closely packed, 4-angled; top of connective truncate or globose. Ovaries numerous; style ovoid or oblong, recurved and grooved; ovules 2 or more, 1-seriate. Ripe carpels stalked, often moniliform; seeds few or many.

Carpels not constricted between the seeds. A small tree. Flowers subsessile, villous	...	...	1. U. pannosa.

Carpels moniliform. An erect or spreading shrub. Petals ·5″ broad. Flowering peduncles ·5″ long ... ... 2. U. discolor.

An erect or climbing shrub. Petals ·25″ broad, very long. Flowering peduncles ·5″ to 1″ long 3. U. Lawii.

1. U. pannosa, Dalz. in Hook. Kew. Jour. Bot. 3, 207; Fl. Br. I. 1, 58; Bedd. Ic. Pl. Ind. Or. t. 52; Cooke Fl. Pres. Bom. 1, 11; *U. farinosa*, Dalz. & Gibs. Bom. Fl. 3.

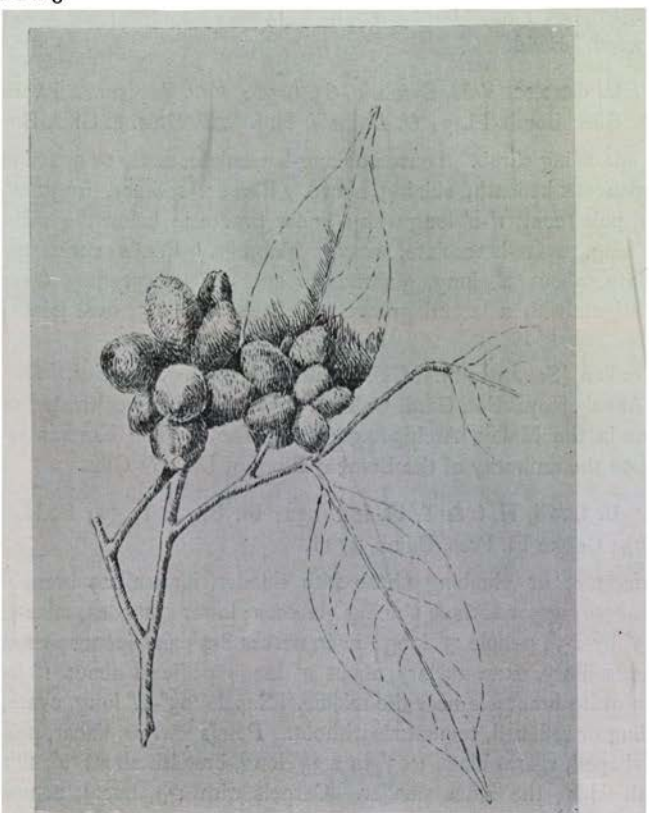


Fig 12. Unona pannosa Dalz.

A small, evergreen tree with long, slender, drooping branches and smooth bark. Leaves ovate, lanceolate, acuminate, membranous, glabrous, shining above, pubescent on the nerves beneath, slightly pellucid-punctate; blade 3″ by

1″; petiole ·15″ long; nerves 6-8 pairs, distinct beneath. Flowers yellowish, 1·5″ long, solitary, axillary or terminal, usually nearly sessile; bracts 1-2, small, scaly. Sepals ·25″ long, ovate, acute, very dark pubescent. Petals 1″-1 5″ long, oblong, clawed, densely brown silky tomentose outside, glabrous within. Carpels 5-7, crowded, obtuse, pubescent, sessile, about ·5″ long.

Endemic in the Western Ghàt forests up to 3500′. "Konkan, Parwar ghàt and Tulawari." Dalz. & Gibs. In the lower tree-storey of the evergreen rain-forest, on the Gairsoppah ghàt near Mulamane; it is however nowhere a common tree. Fl. Oct. Fr. Jan. Feb. Bark smooth. "Yields a strong fibre and possesses a tough wood." Bedd.

2. U. discolor, Vahl. Symb. 2, 63. t. 36; *Var. lævigata*, Fl. Br. I. 1, 59; Dalz. & Gibs. Bomb. Fl. 3; *U. Dunalii*, H. f. & T. Dalz. & Gibs. Bomb. Fl. 3.

A spreading shrub. Leaves oblong-lanceolate, acute or acuminate, 3″-5″ by 1″-2″, glaucous beneath, shining above. Flowers solitary, fragrant; peduncles slender, pubescent, 1″-2″ long with a linear bracteole below the middle. Sepals ·4″-·6″ long, ovate-lanceolate, nearly glabrous. Petals coriaceous, narrowly lanceolate, about 2″ long, glabrous or sparsely pubescent. Ovaries oblong, hairy; stigma with a lateral groove. Carpels with 2-5, oval joints; stalks ·25″ long.

Konkan (Savantvadi). Closely allied to the next species. Dr. King says: in the Annals Royal Bot. Gard. Calcutt. 4, 56. "Perhaps cultivated only in India, common in the Malay, Archipelago and China." The Konkan is given as a habitat on the authority of the Bombay Flora of Dalz. & Gibs.

3. U. Lawii, H. f. & T. Fl. Ind. 132; Fl. Br. I. 1, 59; Bedd. Ic. Pl. Ind. Or. t. 73; Cooke Fl. Pres. Bomb. 1, 11.

An erect or climbing shrub with slender, lenticellate branches. Leaves ovate, acute; upper surface shining glabrous; lower glaucous, minutely strigose; blade 3″ by 1·5″; petiole ·5″ long; main nerves 8-9 pairs, inconspicuous. Flowers scented, solitary, extra-axillary, about 2″ long; pedicels about 1″ long, slender, with an ovate bracteole near the middle. Sepals ·25″-·4″ long, ovate, acuminate, spreading or reflexed, tomentose without. Petals narrow, linear, pubescent, with a cup-shaped, villous claw, 1·25″ to 2·35″ long, breadth about ·2″, silky pubescent on both sides; the inner smaller. Carpels with 1-3, ovoid, acuminate joints; stalk ·25″ long.

Endemic in the Western Peninsula, in tropical, evergreen rain-forests, common near Goond in the Supa sub-division of N. Kanara also in the Konkan at Wari. The flowers of this species are very sweetly scented. Fl. Aug.-Jan., Fr. Jan.-Mar.

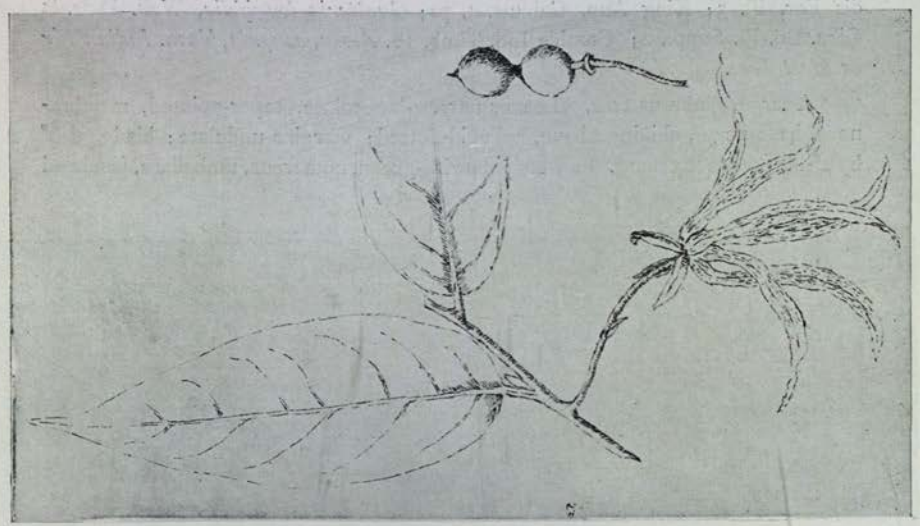


Fig 13. Unona Lawii, Hook, f.

4. POLYALTHIA, Blume.

Trees or shrubs. Flowers solitary or fascicled, axillary or leaf-opposed. Sepals 3, valvate or subimbricate. Petals 6, 2-seriate, flat or the inner vaulted. Torus convex. Stamens many, cuneate; anther-cells extrorse, remote; connective truncately dilated and produced. Ovaries indefinite; style usually oblong; ovules 1-2, basal and erect. Fruit dry or fleshy, long-stalked, consisting of one or more, globose or oblong, 1-seeded carpels.

Leaves glabrous, narrowly lanceolate; edges undulate, Flowers numerous, sub-umbelled. Petals very narrowly linear, ·75″ long	1. P. longifolia.
Leaves elliptic or ovate-acuminate, not glabrous or undulate on the margins. Peduncles cymose, fascicled, usually many-flowered. Petals linear, 1·5″ long, ·2″ broad	2. P. fragrans.
Peduncles 1-3 flowered. Petals ovate-oblong, ·5″ long	3. P. cerasoides.

1. P. longifolia, Benth. & Hook. f. Gen. Plant. 1, 25; Fl. Br. I. 1, 62; Brandis For. Fl. 5; King Ann. Calcutt. 4, 72; *Guatteria longifolia,* Wall. Dalz. & Gibs. Bo. Fl. Suppl. 2; Gamble Ind. Timb. 18. *Asoka, asupala,* Vern. *Indian Fir* or *Mast Tree.*

A large, glabrous tree. Leaves narrow-lanceolate, taper-pointed, membranous, base acute, shining above, pellucid-dotted; margins undulate; blade 5″-8″ by 1″-2″; petiole ·25″ long. Flowers yellowish-green, numerous, umbellate, fascicled

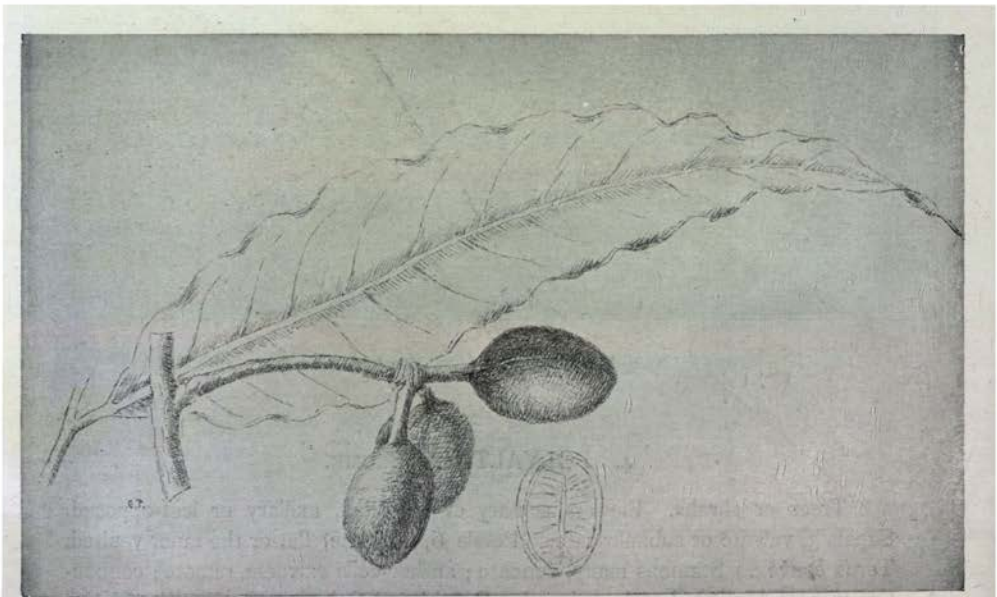


Fig 14. Polyalthia longifolia, Benth.

on short leafless, tuberculate branches; pedicels slender, 1″-1·5″, long, with a small, deciduous, pubescent bract about the middle. Sepals ovate, ·2″ long, pubescent. Petals ·6″ long, very narrowly linear from a broad base. Carpels ovoid, glabrous, shining, turning black when ripe about ·75″ long; stalks ·5″ long.

A handsome, ornamental, evergreen tree, with a dark grey, smooth bark, indigenous in Ceylon; commonly planted in Poona and Bombay public gardens, also about Hindoo temples. Wood close-grained, yellowish, rather soft, tough and easily bent; used in Madras for making casks by the Ordnance and Comissariat Departments. Weighs about 40 pounds to the cubic foot.

2. P. fragrans, Benth. & H. f. (l.c.) Fl. Br. I. 1, 63; Bedd. Ic. Pl. Ind. Or. t. 54; Cooke Fl. Pres. Bomb. 1, 12; Gamble Ind. Timb. 18. *P. coffeoides*, Benth. Talb. Bomb. Trees 7; *Guatteria fragrans*, Dalz. & Gibs. Bomb. Fl. 4. *Gauri*, *Murgauri*, K.

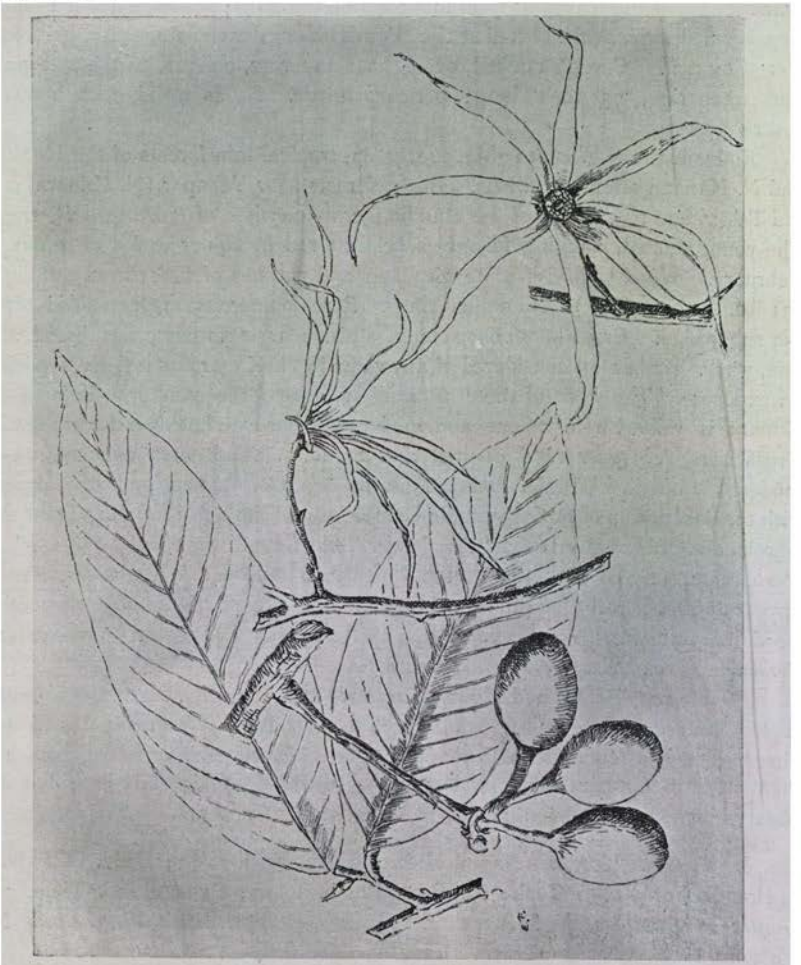


Fig 15. Polyalthia fragrans, Benth.

A tall, evergreen, buttressed tree, 80′ high by 2′ in diameter with smooth, grey bark; young shoots rusty tomentose, older corky. Leaves thin, conspicuously pellucid-dotted when young, ovate or ovate-lanceolate, acute or shortly

acuminate; edges undulate, glabrous, shining above, puberulous on the nerves and midrib beneath and glaucous when young; main nerves 12 to 17 pairs, parallel, distinct above and strong beneath, oblique; blade 5·5″-9·5″ by 1·5″-2·25″; petiole ·25″ long. Flowers greenish-yellow, fragrant or fascicled on the young branches below the leaves or from tubercles on the trunk; peduncle about 1″ long. Sepals small, orbicular, reflexed at tip. Petals oblong-lanceolate, acute, glabrous, 1″-1·5″ by ·12″. Carpels stalked, ovoid, base tapering, oblique, purple and glabrous when ripe, ·75″ to 1″ long; pericarp brittle. Seeds ovoid, with a wavy, ventral groove.

Endemic in the Western ghàt, evergreen, tropical rain-forests of the Konkan and N. Kanara, often gregarious. In the forests near Yellapur (N. Kanara): in the Telgiri kan nearly half of the standing crop consists of "*Murgauri*" trees. The young flaccid, hanging foliage is brilliant red in colour and comes out in February. Wood yellowish-white with lines and patches of dark tissue, soft, light (31 lbs. to the cub. ft.). No annual rings. Pores numerous, medium-sized, often 2-3 subdivided. Cross bars conspicuous. Medullary rays numerous, broad and fine, wavy. Timber not considered of any value in N. Kanara as it decays quickly on exposure. The wood of the "*Gauri*" tree from the southern ghàts of N. Kanara is yellowish in colour and moderately hard and with a silvery grain. Cross bars very numerous, distinct and regular. Med. rays unequal, wavy, moderately broad. Weighs about 40 lbs. to the cub. ft. and generally agrees with the description of *P. fragrans*, in Gamble's Ind. Timb. p. 18. In my Trees and Shrubs etc. published in 1902 "*Murgauri*" was kept distinct from "*Gauri*" as *P. coffeoides*, on the authority of the Calcutta botanists. *P. coffeoides*, Benth. appears however to be confined to Ceylon and except that their respective woods are different I am of opinion that "Gauri" and "Murgauri" are one and the same species viz. *S. fragrans*, Benth.

P. suberosa, Benth. and Hook.; *Guatteria suberosa*, DC. *P. Korinti*, Benth. & Hook. *Guatteria Korinti*, Dunal, and *Guatteria sempervirens*, Dunal (an obscure species founded on Rheede's figures, Hort. Mal. v, t. 16, 18), are mentioned in Graham's list as having been found in the Konkan, but his observations have not been confirmed by subsequent authors.

3. P. cerasoides, Benth. and H. f. (l. c.) Fl. Br. I. 1, 63; Bedd. Fl. Sylv. t. 1; Brandis For. Fl. 5; Cooke Fl. Pres. Bomb. 1, 13; Gamble Ind. Timb. 17; *Guatteria cerasoides*, W. & A. Prodr. 10; Dalz. & Gibs. Bomb. Fl. 3. *Hoom*, M.; *Vabbina*, K.

A small or moderate sized tree, young branches tomentose. Leaves membranous, oblong-lanceolate, pubescent beneath; upper surface glabrous except the pubescent midrib; lateral nerves about 12 pairs, rather strong beneath; blade 3″-6″ by 1″-2″; petiole ·25″ long. Flowers axillary, solitary, long pedicelled or 2-3

together from woody tubercles; pedicels about 1″ long, tomentose, often with 1-2 ovate, concave bracts. Sepals membranous, ovate-lanceolate, adpressed hairy outside, glabrous within, reflexed, not much shorter than the petals. Petals spreading, dirty green, very coriaceous, puberulous, ·4″ long. Carpels numerous, dark red, ·25″ in diameter; stalk 1″ long, slender.

A small, evergreen tree found on the dry hills from Behar southward to Tinnivelly; in Burma, on the Prome and Shan hills and throughout the monsoon-forests of the Bombay ghâts. It is usually confined to dry, deciduous, mixed forests but is occasionally met with in the evergreens, and is nowhere common. Bark rough, grey, ·25″ thick. Wood olive-grey, moderately hard, close-grained. Used for carpentry and boat building. Weighs 52 lbs. the cubic foot. Fl. Feb.-May., Fr. R.S.

5. GONIOTHALAMUS, Blume.

Small trees or shrubs. Leaves shining above with oblique parallel nerves. Flowers solitary or fascicled, axillary; peduncles with basal, scaly bracts. Sepals 3, valvate. Petals 6; outer thick, flat; inner smaller, cohering in a conical cap, covering the stamens and shortly clawed. Stamens many; connective produced into an oblong process. Ovaries many; ovules solitary or 2 superposed in each; style elongate; stigmas 2-lobed. Carpels 1-seeded.

Baillon in the Histoire Naturelle des Plantes unites *Goniothalamus* with *Oxymitra*.

G. cardiopetalus, H. f. & T. Fl. Ind. 107; Fl. Br. I. 1, 75; Bedd. Fl. Sylv. 8; *Polyalthia cardiopetala*, Dalz. in Hook. Kew Jour. Bot. 11, 39; *P. Wynaadensis*, Bedd. Mss. in Herb. Madras. (*Atrategia Thomsoni*, Bedd. Mss.)

A large shrub or small tree. Leaves large, membranous, lanceolate or obovate, bluntly acuminate, margin minutely waved, glabrous on both surfaces; main nerves about 12 pairs, interarching far from the margins; blade 6″-11″ by ·2″-2·5″; petiole ·35″ long. Flowers solitary or 2-3 superposed, axillary, shortly pedicelled, about ·75″ across; pedicels ·25″-·5″ long, minutely bracteolate at the base. Sepals small, orbicular, retuse, ·25″ across. Petals velvetty tomentose; 3 outer cucculate, concave, acute, clawed, ·5″-·75″ long; 3 inner shorter, ovate, acute and marked with the figure of a heart when fresh, united in an arch at the top. Style elongate, 2-fid; ovule solitary. Carpels ovoid, apiculate, sessile, ·5″ long.

Apparently endemic in Southern India; in Kanara and N. Wynaad up to 3000′. North Kanara ghâts, in evergreen rain-forests, common on the Ankola forests. Fl. March. Fr. R. & C. S.

Usually a large shrub with a long, leading shoot and few branches.

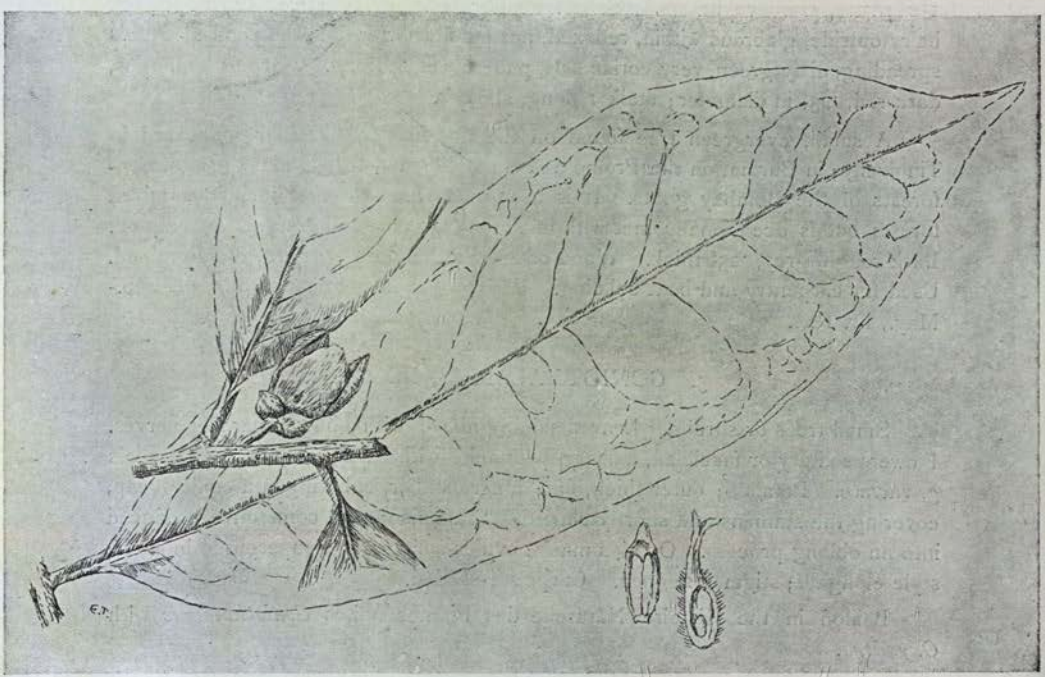


Fig 16. Goniothalamus cardiopetalus, Hook f.

6. ANONA, L.

Trees or shrubs. Flowers solitary or fascicled, terminal or leaf opposed, bracteate. Sepals 3, valvate. Petals 3 or 6, 2-seriate, the outer sessile, broad, concave at base, the inner rarely so, valvate or imbricate. Stamens indefinite, on a hemispherical torus; top of connective dilated, truncate or ovoid. Ovaries many, subconnate; ovules 1-2, erect. Carpels united into a large, fleshy fruit; seeds numerous, imbedded, in pulp.

Fruit tubercled. Flowers solitary	...	....	1. A. squamosa.
Fruit smooth. Flowers 2-3 together...		...	2. A. reticulata
Fruit very large, muricate	...	...	3. A. muricata.

1. *A. squamosa*, Linn. Fl. Br. I. 1, 78; Bedd. Fl. Sylv. 9; Brandis For. Fl. 6; Gamb. Ind. Timb. 20. *Sweet Sop, Custard Apple, Sita-phul,* H.

A small tree or large shrub. Leaves glabrous above, glaucous beneath, pubescent when young, oblong, lanceolate, pellucid-punctate; blade 2″-3″ by ·75″-1·5″; lateral nerves 8-11 pairs; petioles ·5″ long. Flowers solitary, leaf opposed or 2-4 together, on short, extra-axillary branchlets; pedicels ·5″-·75″ long. Sepals minute, triangular, pubescent, connate at the base. Petals valvate, pubescent; 3 outer 1″ long, lanceolate, fleshy, cup-shaped at the base; inner minute or wanting. Fruit large, globose, 2″-4″ in diameter, yellowish green, presents the appearance of a pine cone. Carpels lozenge-shaped, easily separable in pieces from the central torus; outside tough, smooth and rounded; inside the seeds are covered with a white or yellowish pulp. Seeds oblong, deep brownish black, shining, acrid.

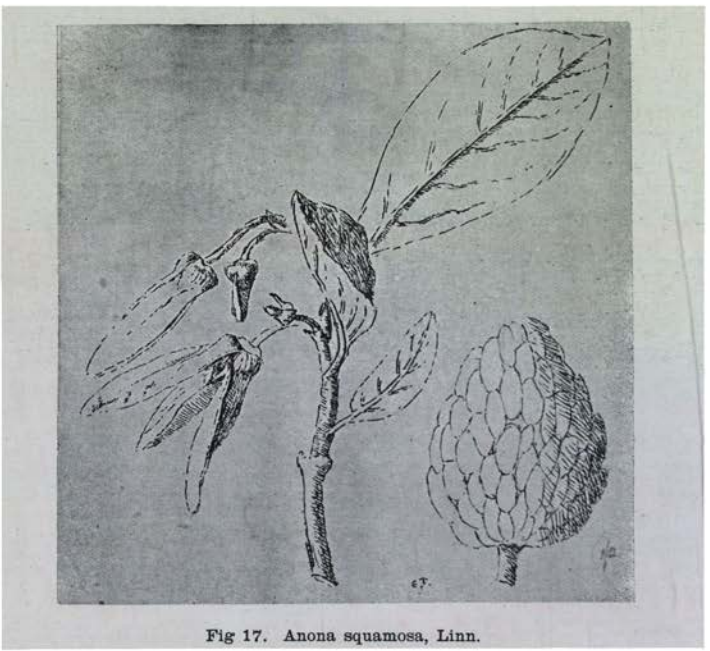


Fig 17. Anona squamosa, Linn.

A small tree with thin bark, naturalized throughout Asia, but is almost certainly indigenous in the West Indian Antilles, cultivated throughout the tropics for its perfumed, edible fruit. In some of the forests of the Dharwar district it is thoroughly domesticated and appears almost wild in places along the N. Kanara border. New leaves appear on the tree about March but it is nearly an evergreen. Flowers near Poona during the rainy season. Fruit ripe during Aug. Oct.

2. *A. reticulata*, Linn; Fl. Br. I. 1, 78; Gamble Ind. Timb. 21; Bedd. Fl. Sylv. 9. *Bullock's heart, Ram-phul*, H.

A small or medium-sized tree. Leaves thin, 4″-7″ by 1″-1·75″, oblong-lanceolate, acute or obtuse, minutely pellucid-punctate, glabrous above, pubescent beneath when young; lateral nerves 8-11 pairs; petioles ·5″ long. Flowers solitary, leaf-opposed, bracteate below the middle. Sepals small, triangular, tomentose. Outer petals 1·25″ long by ·25″ broad, tomentose on both surfaces; inner petals minute. Fruit globose, 4″-6″ in diameter, somewhat heart shaped, yellowish red when ripe with the areoles pentagonally marked, on the rough outer surface. Seeds smooth, black-coloured.

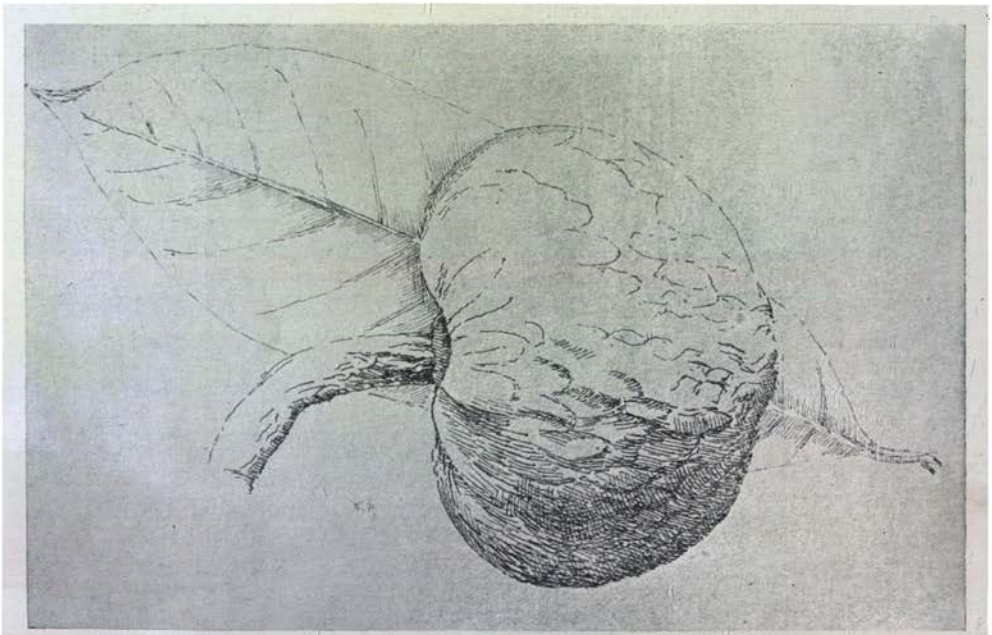
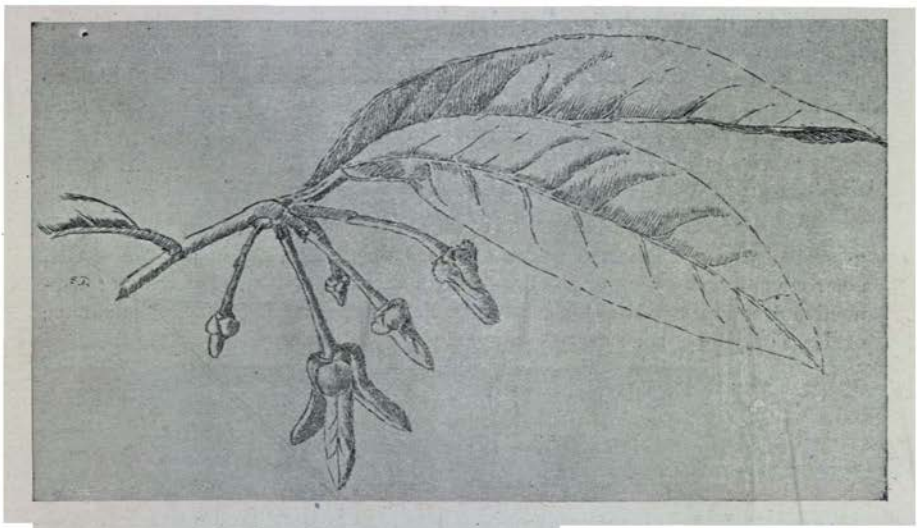


Fig. 18. Anona reticulata, Linn.

This tree which attains a larger size than *A. squamosa,* or *A. muricata,* is wild in the West Indies, Cuba, Barbados, Jamaica, etc. also in New Granada. It has been introduced into most of the countries of tropical Asia. Commonly planted along river banks in the black soil of the Poona district. Trees 30′ to 50′ high and from 1·5′-2′ in diameter are not uncommon. The fruit ripens in the hot season and is a favourite with the natives of India but is not appreciated or generally eaten by Europeans.

3. *A. muricata*, DC. Syst. 467; Bedd. Fl. Sylv. 9; Dalz. & Gibs. Bomb. Fl. Suppl. 2; Gamble Ind. Timb. 21. *Sour Sop*.



A small tree. Leaves large, ovate, obovate, acute or bluntly acuminate, rounded at the base, glabrous; blade 7″-2·5″ by 2·5″-1·5″, thinly coriaceous, pellucid punctate; lateral nerves about 12 pairs, prominent beneath. Flowers in axillary, leaf opposed, pedicelled, few flowered racemes. Sepals triangular, shortly acuminate, pubescent. Petals greenish-yellow, usually 3, fleshy, triangular, united, thickened and saccate at the base, pubescent on both surfaces, about 1″ long; pedicels stout, bracteate in the middle, thickened at the tip, 1″-2″ long. Fruit large 2″-4″ in

Fig. 19 & 20. Anona muricata, DC. (*Flowers & Fruit*).

diameter, globose, often of irregular growth. Carpels do not separate (like in *A. squamosa*), each with an acute tip, giving the surface of the fruit a muricate appearance.

Wild in the West Indies, Cuba, St. Domingo, Jamaica and other smaller islands. The "*Sour Sop*" is cultivated in gardens near Poona and Bombay but not nearly to the same extent as either *A. reticulata,* or *A squamosa.* Flowers and fruits during the rainy season from June till August. The fruit sometimes weighs as much as 5 lbs. The seeds are astringent.

7. SACCOPETALUM, Benn.

Trees. Leaves deciduous. Flowers axillary, solitary or fascicled. Sepals 3, small, valvate. Petals 6, valvate, in 2 series, outer small, like the sepals, inner much larger, erect, or conniving; base saccate. Stamens indefinite; connective produced into a conspicuous, apiculate appendage. Ovaries indefinite; ovules 6 or more. Ripe carpels sub-globose.

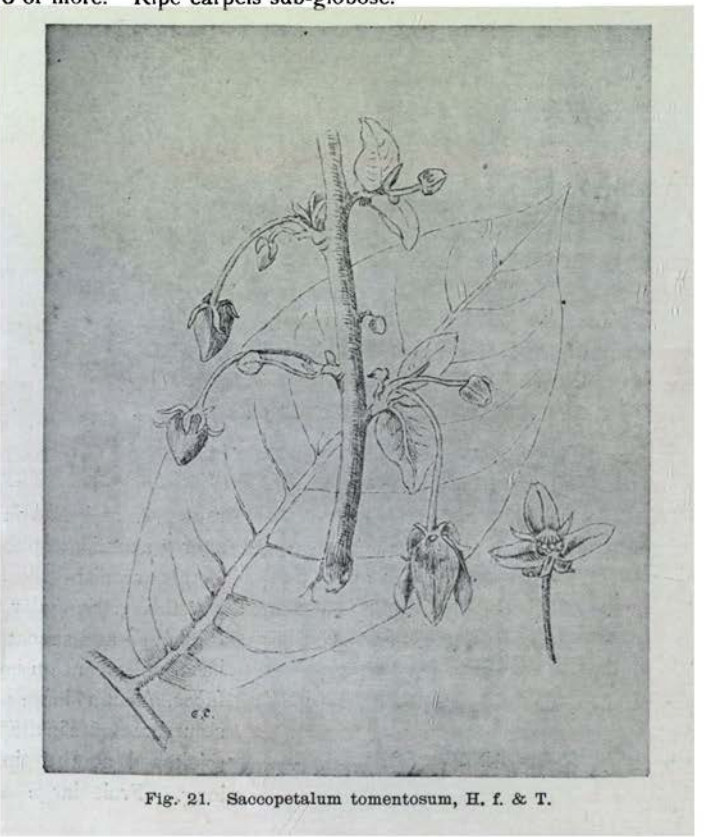


Fig. 21. Saccopetalum tomentosum, H. f. & T.

S. tomentosum, H. f. & T. Fl. Ind. 152; Fl. Br. I. 1, 88; Bedd. Fl. Sylv. 10; Brandis For. Fl. 7; Dalz. & Gibs. Bomb. Fl. 4; Gamble Ind. Timb. 22. *Hoom,* H.; *Wumb,* K.

A large tree; young shoots silky-tomentose. Leaves thin, ovate, acute, pubescent beneath, nearly glabrous above, the midrib always pubescent; main nerves 6-11 pairs, spreading, prominent beneath; blade 4″-6″ by 2·5″-3″; petiole short. Flowers yellowish, 1″ in diameter, bracteolate at the base, in 2-4-flowered cymes; pedicels 2″-3″ long, slender, downy. Sepals minute, nearly equal to the outer petals; inner petals ·5″ long, oblong, obtuse, saccate at the base, minutely pubescent on both surfaces. Stamens numerous, apiculate, on a subglobose torus. Ovaries broadly ovate; ovules 4-6 in 2 rows. Carpels globose, succulent, purple, tomentose, 1″ in diameter, on stalks ·5″ long, 3-4-seeded.

Nepal Terai, Guzerat, Rajputana, Central India, Behar, Orissa and deciduous, mixed, monsoon-forests of the Western Ghàts from the Konkan to Travancore; common in the forests of Mundgod and Dasankop, N. Kanara. A tall, deciduous tree with thick, brown, cracked and furrowed bark and a straight stem. Wood olive-brown with a silvery grain, moderately hard, smooth and close-grained, mottled; no heart-wood. No annual rings. Weighs 45 lbs. to the cubic foot. Used for building purposes. Leaves are shed in March. Flowers and young leaves appear together in March, April. Fruit ripe June.

8. OROPHEA, Blume.

Trees or shrubs. Flowers small, axillary, solitary, fascicled or cymose. Sepals 3, valvate. Petals 6, valvate, in 2 series; exterior ovate; inner long-clawed, cohering into a mitriform cap. Stamens definite, 6-12, fleshy; anther-cells large, contiguous; connective pointed, not truncate. Ovaries 3-15; ovules 4. Ripe carpels often globose, one or more seeded.

O. zeylanica, H. f. & T. Fl. Ind. III.; Fl. Br. I. 1, 90; Bedd. Fl. Sylv. 11; Cooke Fl. Pres. Bomb. 1, 16; King Ann. Roy. Bot. Gard. Calcutta Vol. IV. t. 205.

A shrub or small tree; young branches yellowish pubescent. Leaves thin, ovate, bluntly acuminate, slightly oblique at the base, puberulous when young, ultimately glabrous; main nerves 5-6 pairs, very faint; blade 2·5″ by 1″; petiole very short ·2″ long. Flowers white, small, varying from ·2″ to ·4″ across, on slender, 1-3-flowered, bracteolate, axillary pedicels ·1″-1″ long. Sepals orbicular, pubescent. Outer petals similar to sepals but larger; inner petals ·3″ long, thick, triangular with bright red claws. Stamens 6; anther-cells wide apart, in a single row; connective apiculate. Ovaries 12-15, obovate, glabrous; ovules 2. Carpels globose, smooth, 2-seeded, size of a large pea; stalks short. Seeds hard and tough.

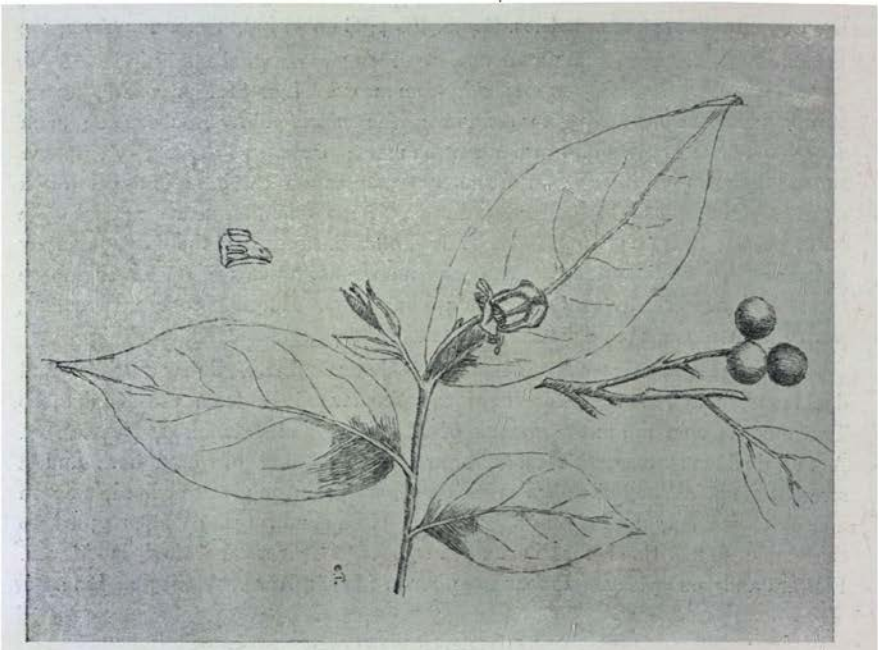


Fig 22. Orophea zeylanica.

Western Peninsula from N. Kanara to Coorg, also in the Central Provinces of Ceylon. In N. Kanara it is abundant in the evergreen rain-forests near the "Yena Rocks" (Kumpta sub-division); and is scarcely anything more than a small shrub, which flowers and fruits at different times throughout the year. The flowers vary in size. Sir G. King describes them as green, I have found them white with red-clawed petals.

9. SAGERÆA, DALZ.

Trees. Leaves smooth, shining. Flowers small, terminal, axillary or fascicled on woody tubercles, 1-2-sexual. Sepals 3, ovate, imbricate. Petals 6, in 2 series, imbricate, nearly equal, usually orbicular and concave. Stamens 6-21, imbricate, in 2 or more series, thick, fleshy; anther-cells oblong; connective produced. Ovaries 3-6; ovules 1 or 2-8 on the ventral suture. Ripe carpels globose, stalked.

In his Anonaceæ of British India, Dr. King has separated *Sageræa* from *Bocagea*, St. Hilaire, to which genus it had been united in the Fl. Br. I. by

Sir J. Hooker. The extreme imbrication of the sepals and petals in *Sageræa* appears to Dr. King an insurmountable objection to its being included in *Bocagea* which possesses a valvate calyx and corolla. Baillon also in his Histoire Naturelle des Plantes retains *Sageræa* as a separate genus. It should therefore I think be included in the section of the tribe *Uvarieæ* with imbricating sepals. *Bocagea*, St. Hilaire, a tropical Asian and S. American genus, has the sepals and petals valvate and belongs to the tribe *Unoneæ*.

S. laurina, Dalz. in Kew Jour. Bot. 3, 207; Dalz. & Gibs. Bomb. Fl. 2; King Anon. Roy. Bot. Gard. Calcutta, Vol. IV, 7; Gamble Ind. Timb. 15; *S. Dalzellii*, Bedd. Ic. Pl. Ind. Or. t. 42; *Bocagea Dalzelli*, Hook. f. & Thoms. Fl. Br. I. 1, 92; *Guatteria laurifolia*, Grah. Cat. Bo. Pl. 4. *Sageri, har-kinjal, undie,* M.

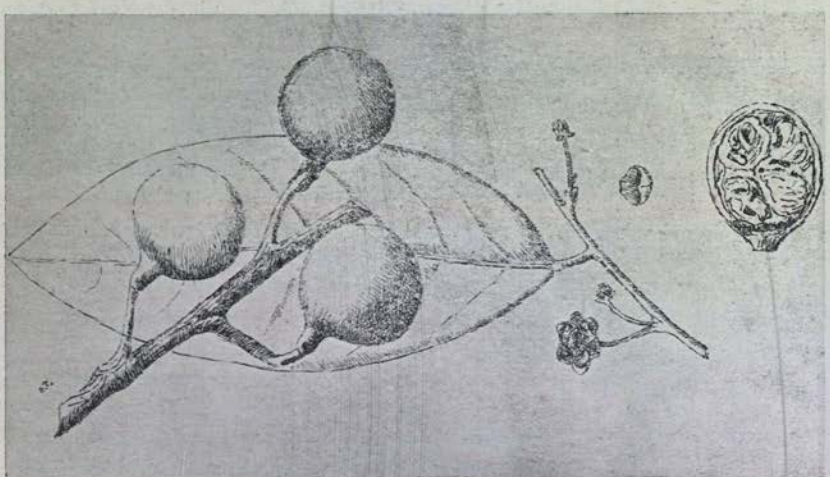


Fig 23. Sageræa laurina, Dalz.

A small or moderate sized tree; branches slender. Leaves coriaceous, shining above, dull beneath; oblong-lanceolate; apex subacute; base rounded or sub-cuneate; main nerves 10-12 pairs, spreading, very faint; blade 4·5″-10″ by 1·5″-3″; petiole ·25″ long. Flowers white, about ·3″ across, solitary or in fascicles of 2-10, on small, woody tubercles below the leaves; pedicels ·5″-1″, with numerous, scaly bracteoles at the base. Sepals orbicular, glabrous, ciliate on the margins. Petals very concave, orbicular, the outer scarcely larger than the inner. Stamens 12-18; outer row sometimes without anthers; connective broad, projecting, truncate. Ovaries 3-5, oblong hairy; ovules about 12, in 2 rows. Carpels green, globose about 1″ in diameter, sub-sessile, glabrous.

Apparently endemic in the evergreen rain-forests of the Western Peninsula, from the Konkan to Travancore. In N. Kanara it is found in the forests near the Ainshi ghát but is by no means a common species.

A moderate-sized tree with a cylindrical stem and dark coloured, scaly bark. Fl. Oct. Nov. Wood light yellow or red, hard, even grained, rather heavy; cross bars prominent, regular. Pores moderate-sized to large, often filled with a white substance. Medullary rays moderately broad, long, not numerous but regular, Gamble.

Order V.—MENISPERMACEÆ.

Climbing shrubs. Leaves alternate, entire, usually palmi-nerved, often peltate; stipules O. Flowers small or minute, fascicled, racemose or panicled, usually trimerous, dioecious or polygamous, sometimes 3-bracteolate. Sepals usually 6, free; the outer 3 often minute. Petals 6-o, free or connate. Male fl.: Stamens usually 6, opposite the petals, rarely fewer or more; filaments free or connate; anthers extrorse or lateral. Female fl.: Staminodes 6-o. Carpels free, distinct, usually 3; style terminal, simple or divided; ovules solitary, usually amphitropous. Ripe carpels generally drupaceous; seed enclosed in a woody or coriaceous endocarp, usually curved or reniform; the radicle pointing towards the scar of the style which is either sub-terminal or sub-basal; albumen equable, ruminate or O; cotyledons flat or semiterete, foliaceous or fleshy, adpressed or spreading.

Flowers trimerous. Ovaries 3. Seed oblong or globose; albumen scanty or copious; cotyledons foliaceous. (*Tinosporeæ*).

- Filaments free. Drupes red, dorsally convex... 1. Tinospora.
- Filaments connate. Drupes black, dorsally gibbous ... ... 2. Anamirta.

Flowers trimerous. Ovaries usually 3. Seed horse-shoe shaped; albumen copious; cotyledons linear. (*Cocculeæ*).

- Ovaries 3-12. Dry fruit obovoid-oblong, not tubercled. Anthers 2-lobed, dehiscing longitudinally ... ... 3. Tiliacora.
- Ovaries 3-6. Dry fruit, circular, compressed, strongly, tubercled. Anthers 4-lobed, dehiscing transversely ... ... 4. Cocculus.

Flowers 3-5-merous. Ovaries usually 1. Seed horse-shoe shaped; albumen scanty; cotyledons slender, adpressed. (*Cissampelideæ*).

- Sepals 6-10, free, Petals of ♂ and ♀, 3-5, free... 5. Stephania.
- Sepals 4, free. Petals of ♂, 4, connate, of ♀, 4-8, connate ... ... 6. Cissampelos.
- Sepals 4-8, connate. Petals of ♂, 4-8, connate, of ♀, 1... ... ... 7. Cyclea.

1. TINOSPORA, MIERS.

Deciduous climbing shrubs. Leaves cordate or truncate at the base. Flowers very caducous, in axillary or terminal, elongate racemes or panicles. Sepals 6, in 2 series; inner larger, membranous. Petals 6, smaller than the sepals. Male fl.: Stamens 6; filaments free, thickened at the tips; anthers dehiscing by oblique, marginal slits. Female fl.: Staminodes 6, clavate. Ovaries 3; stigmas forked. Drupes 1-3, ovoid, dorsally convex, ventrally flat; seed ovoid, deeply hollowed on the ventral side; style-scar subterminal; putamen tubercled, dorsally keeled, intruding; albumen ruminate on the ventral side only; cotyledons leafy, ovate, divaricate.

Leaves large, woolly beneath. Flowers green... 1. T. malabarica.
Leaves smaller, glabrous. Flowers yellow ... 2. T. cordifolia.

1. T. malabarica, Miers Contrib. 3, 32; Fl. Br. I. 1, 96; Dalz. & Gibs. Bomb. Fl. 5; Cooke Fl. Pres. Bomb. 1, 18; *Cocculus malabaricus*, DC. Syst. 1, 518; Grah. Cat. 4. *Gulvel,* M.

A large, climbing shrub; stems ·75″ in diamter; branchlets clothed with white hairs; bark grey, papery, covered with scattered, prominent lenticels. Leaves large, membranous, broadly ovate, cordate, acuminate, 4″-6″ across, 7-basal-nerved, pubescent above, nearly woolly beneath; petiole grooved, 3″-4″ long, pubescent. Flowers green on slender, clustered pedicels, arranged in slender, drooping, axillary racemes 3″-6″ long. Sepals 6, outer smaller. Petals obovate, cuneate. Ripe drupes ovoid, ·4″ long, smooth, red, on very short, thick stalks; endocarp covered with sharp-pointed tubercles.

Western Peninsula, Sikkim, Khasia hills and Chittagong, Burmah and Ceylon. Moist monsoon-forests of the Konkan and N. Kanara, (Ainshi ghát forests) but nowhere common, also occurs in the Tannah district near Bassein, where the boiled roots are given in fever cases. A section of the stem shows the characteristic anomalous, structure of the Menispermaceous wood. Fl. H. S. Fr. June.

2. T. cordifolia, Miers Contrib. 3, 31; Fl. Br. I. 1, 97; Brandis For. Fl. 8.; Dalz. & Gibs. Bomb. Fl. 5; Cooke Fl. Pres. Bomb. 1, 18; Gamble Ind. Timb. 24. *Gulaveli, gulwail, giroli,* M.; *Gulo,* Vern.; *Amrutbali,* K.

A glabrous, succulent, climbing shrub with corky, lenticellate bark and long filiform, aerial roots from the branches. Leaves thin, ovate-cordate, acute; 7-basal nerved; blade 2″-4″ long; petiole 1″-3″ long. Flowers small, ·2″ across, very caducous, in slender, axillary racemes, about 6″ long; pedicels ·2″-·3″ long, filiform; bracteoles minute. Male flowers fascicled, females solitary. Sepals 3, outer minute; the 3 inner much larger, rounded and concave, veined. Petals ½ the sepals, thick, spathulate, each embracing a stamen. Drupes 1-3, red, plano-

convex, size of a small cherry or large pea, glutinous pulpy; style-scar lateral; peduncles ·5″-·75″ long, thickened at the tops and with small subulate, persistent bracts at the thickened bases; endocarp rugose, kidney-shaped; albumen ruminate.

Throughout tropical India, common in hedges. Found in the Deccan, Konkan and N. Kanara monsoon-forests, also sometimes planted. Stems thick, deeply grooved. Bark corky, grey and very thin, scaly on the branches. Wood white, soft, and porous. The aerial, pendulous roots are long, and slender like whipcord. Stems and roots used in native medicine for fevers. "*Gulo*" of the bazaars. Fl. C. & H. seasons. Fr. H. & R. seasons.

2. ANAMIRTA, COLEB.

A climbing shrub. Flowers panicled on the old wood. Sepals 6, somewhat unequal, with 2, adpressed bracts. Petals O. Male fl.: Anthers sessile on a column. Female fl.: Staminodes 9, clavate, 1-seriate. Ovaries 3, on a short gynophore; stigma sub-capitate, reflexed. Drupes stalked on a 3-fid gynophore, obliquely ovoid, dorsally gibbous; style-scar sub-basal; putamen woody. Seed globose, embracing the hollow, intruded endocarp; albumen almost ruminate, dense, consisting of horny granules; embryo curved; cotyledons narrow-oblong, thin, spreading.

A. Cocculus, W. & A. Prodr. 1, 446; Fl. Br. I. 1, 98; Brandis For. Fl. 8; Dalz. & Gibs. Bomb. Fl. 4; *Anamirta paniculata*, Coleb; Cooke Fl. Pres. Bomb. 1, 19; *Menispermum Cocculus,* L. Roxb. Fl. Ind. 3, 807; *Cocculus suberosus,* DC. Syst. 1, 519; Grah. Cat. 4. *Kakaphula, kakmari,* Vern.; *Garud phul,* Kon. *The Cocculus Indicus* of Pharmacy.

Bark thick, corky. Leaves coriaceous, broadly ovate, cordate or truncate at the base, acute or acuminate, base 3-5-nerved, hairy in the axils beneath; 4″-8″ long and about as broad; petioles 2″-6″ long. Panicles pendulous on the old branches, 1′-1·5′ long. Flowers ·25″ across, glabrous; buds globose. Sepals concave, deciduous, with 2 small, adpressed bracts. Anthers in the male flowers numerous, forming a globose head on the combined filament's column. Ovaries 3, on a short gynophore, surrounded by a ring of minute, bifid staminodes; stigmas reflexed. Ripe carpels 1-3, globose, ·5″ in diameter, on a 1-3-fid, thickened, globose gynophore. Fruit panicles like bunches of grapes in appearance; the intruded endocarp is rough, warty; albumen dense with an enclosed horse-shoe shaped embryo.

Eastern Bengal, Khasia, Burmah and Assam, Western and Southern India, from the Konkan to Ceylon. In the moist rain-forests of the Konkan and N.

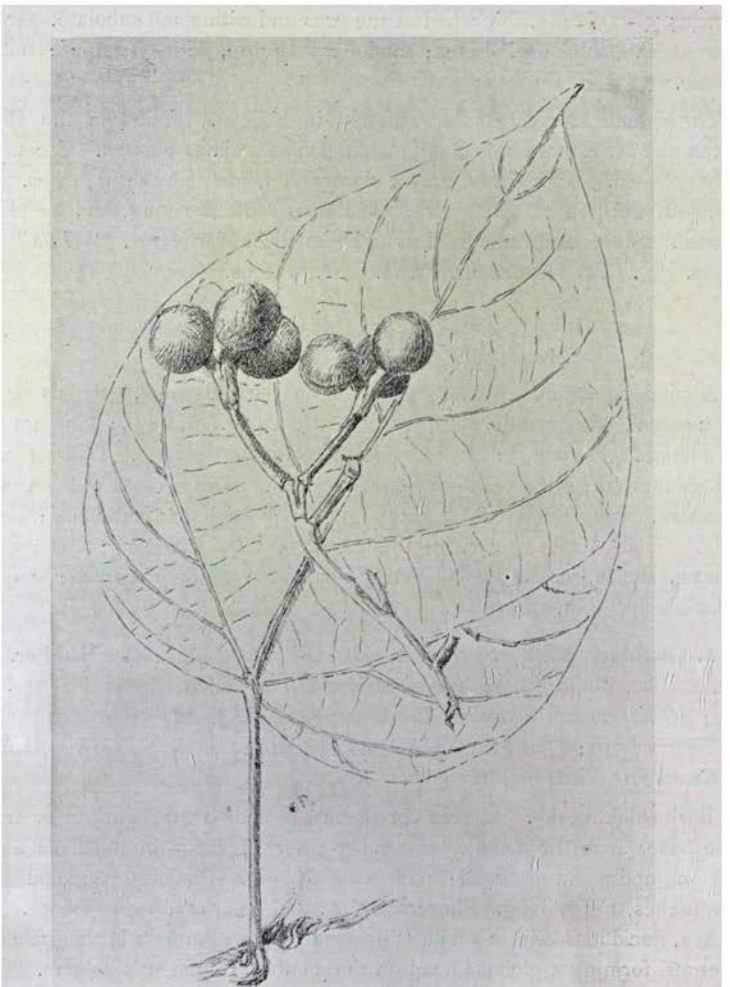


Fig 24. Anamirta Cocculus, W. A.

Kanara, (Nilkund ghát forests) but nowhere common. The white berries which turn black when ripe are used to poison fish and to adulterate beer. The seeds yield a fixed oil used in an ointment for skin diseases and for industrial purposes.

3. TILIACORA, COLEB.

A climbing shrub. Leaves ovate. Flowers in axillary panicles, dioecious or polygamous. Sepals 6, 2-seriate; outer much smaller. Petals 6, minute, cuneate. Male fl.: Stamens 6, free. Female fl.: Carpels 9-12; styles short, subulate. Drupes stalked; putamen sulcate; albumen oily, ruminate; cotyledons linear, fleshy, plano-convex.

T. racemosa, Coleb. in Trans. Linn. Soc. XIII. 67; Fl. Br. I. 1, 99; Cooke Fl. Pres. Bomb. 1, 20; *Cocculus acuminatus*, DC. Grah. Cat. 5; Rheede Hort. Mal. VII, t. 3.

A woody climber with striate, cinerous branches. Leaves coriaceous, glabrous, ovate, acuminate, cordate, truncate or rounded and 3-5-nerved at the base; blade 3″-6″ by 1·5″-4″; petiole 1″ long. Flowers ·25″ across, yellow, in elongate, axillary, raceme-like panicles, 6″-12″ long; branches of panicle 1″ long, puberulous when young, at length glabrous, each bearing 1 female and 3-7 male flowers. Sepals 6, in 2 series; outer smaller. Petals 6, minute. Stamens 6. Ovaries 3-12; styles short. Drupes 3-12, compressed, obovoid ·5″ long.

This climbing species is included in his Flora of Bombay by Dr. T. Cooke on the authority of Nimmo, fide Graham l. c. I have not observed it in either N. Kanara or the Konkan nor does it appear to have been collected since Nimmo's time. It is not mentioned in Dalz. & Gibs. Flora.

4. COCCULUS, DC.

Woody climbers. Flowers in axillary, usually short panicles. Sepals 6, biseriate; inner 3 larger. Petals 6, usually auricled, shorter than the sepals, entire or 2-cleft. Male fl.: Stamens 6, free, embraced by the petals; anthers subglobose; cells opening transversely. Female fl.: Staminodes 6 or 0. Ovaries 3-6; styles usually cylindric. Drupes laterally compressed; style scar nearly basal. Endocarp tuberculate, horse-shoe shaped; sides excavate; seed curved, horse-shoe shaped; albumen fleshy; embryo annular; cotyledons linear, flat, adpressed

Leaves more or less glabrous, sub-orbicular, long petioled. Flowers in large panicles ... ... 1. C. macrocarpus.

Leaves ovate or deltoid, villous. Male flowers in short, cymose panicles. Female flowers in axillary clusters of 2 or 3 ... ... 2. C. villosus.

Leaves oblong or trapezoid, glabrate. Male flowers fascicled; female flowers usually solitary... ... 3. C. Leæba.

1. C. macrocarpus, W. & A. Prodr. 13; Fl. Br. I. 1, 101; Dalz. & Gibs Bomb. Fl. 5; Grah. Cat. 5; Cooke Fl. Pres. Bomb. 1, 20; Gamble Ind. Timb. 25. *Vatoli, vatyel, ramrick,* M.

A large climber; young branches brown, striate. Leaves rounded, reniform, truncate or cordate at the base, with 5 basal nerves, shining above, glaucous

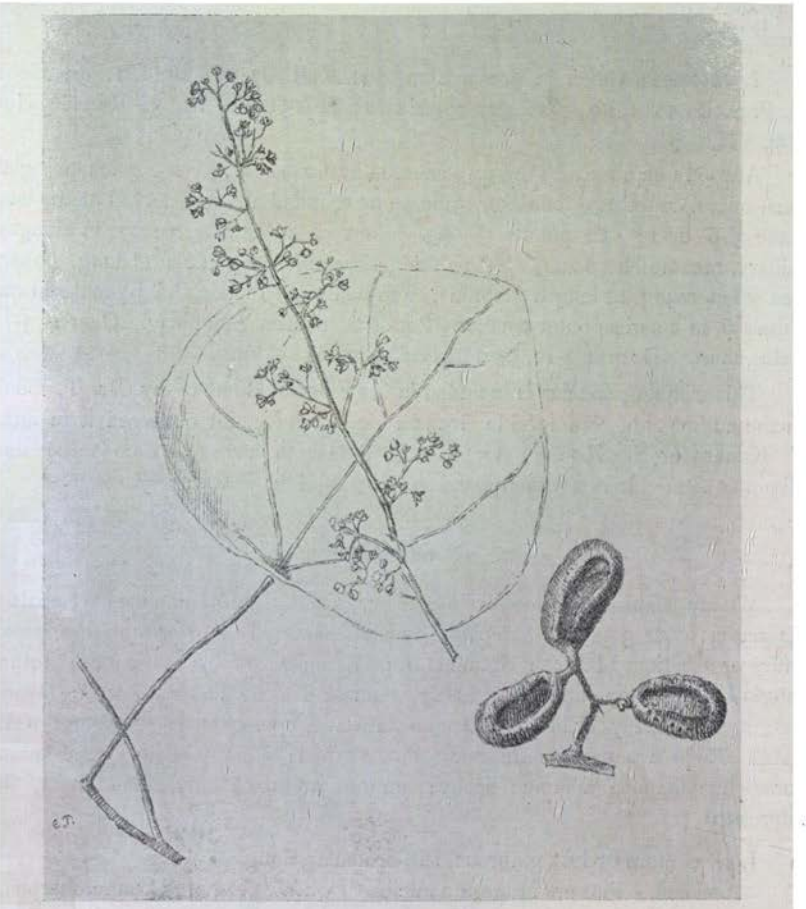


Fig 25. Cocculus macrocarpus, W. A.

beneath; blade 2″-4″ by 2·5″-4″; petiole 2″-4″ long. Panicles pendulous, slender, about 1′ long, on the old branches and stems. Flowers yellow, fascicled or umbelled along the rachis on slender pedicels. Sepals thin, marked with spots and purple lines. Petals 3-lobed, the middle one emarginate, the lateral lobes

embracing the stamens. Drupe obovoid, curved, 1″ long; blue, covered with white bloom; style-scar conspicuous; endocarp thin, woody, transversely ridged. Seed bent like a hook.

Western Ghâts from the Konkan southwards; also in the Nilghiris and Ceylon. In the Konkan and North Kanara, in fringing forests along banks of rivers and nalas and in moist monsoon and rain-forests, locally abundant. Fl. Feb.-March. Fr. May.

The stems of this lofty climber often attain 1′ in diameter, and are usually much flattened. Bark thin, greyish and wrinkled. The soft grey coloured wood consists of wedges containing large and small pores. At the end of each wedge is a small mass of pith-like tissue. The wedges are themselves separated radially by the broad medullary rays which are joined by concentric belts of similar tissue to that in the rays themselves, these along with the darker coloured pithy tissue form conspicuous concentric, (annual?) rings of growth. The pores increase in size and number from the centre of the stem outwards. The medullary rays of each ring of growth are separate and do not join those of another ring.

2. C. villosus, DC. Prodr. 1, 98; Fl. Br. I. 1, 101; Dalz. & Gibs. Bomb. Fl. 5; Brandis For. Fl. 9; Cooke Fl. Bomb. Pres. 1, 21. *Kursan, zamir,* Sind. *Vasanvel, parvel,* M., *Vasandi,* Sans.

A villous, climbing undershrub. Leaves ovate, sub-deltoid or 3-lobed, obtuse or mucronate, subcordate or truncate at the base; blade 1·5″ by ·5″; petioles very short, ·1″ long. Male flowers in short, cymose panicles; pedicels slender; bracts minute. Sepals with the 3 inner larger. Petals thin, emarginate, embracing the stamens. Female flowers 1-3 together, small, usually clustered in the leaf axils, pedicelled. Petals thick, fleshy, triangular, bi-lobed at the apex; claw hairy. Ovaries 3, smooth; stigmas reflexed. Drupes small, size of a small pea, dark purple; endocarp bony, horse shoe shaped or nearly annular; centre perforated, sharply keeled along the back; the sides with strong transverse ridges.

Dry and arid parts of India from Sind to Bengal and southwards to Ceylon, also in the dry regions of Africa. Common in hedges throughout the Presidency and Sind. Fl. Feb.-March. Root a substitute for Sarsaparilla. Juice of the leaves mixed with water coagulates into a green jelly. The juice of the ripe fruits makes a kind of bluish purple ink.

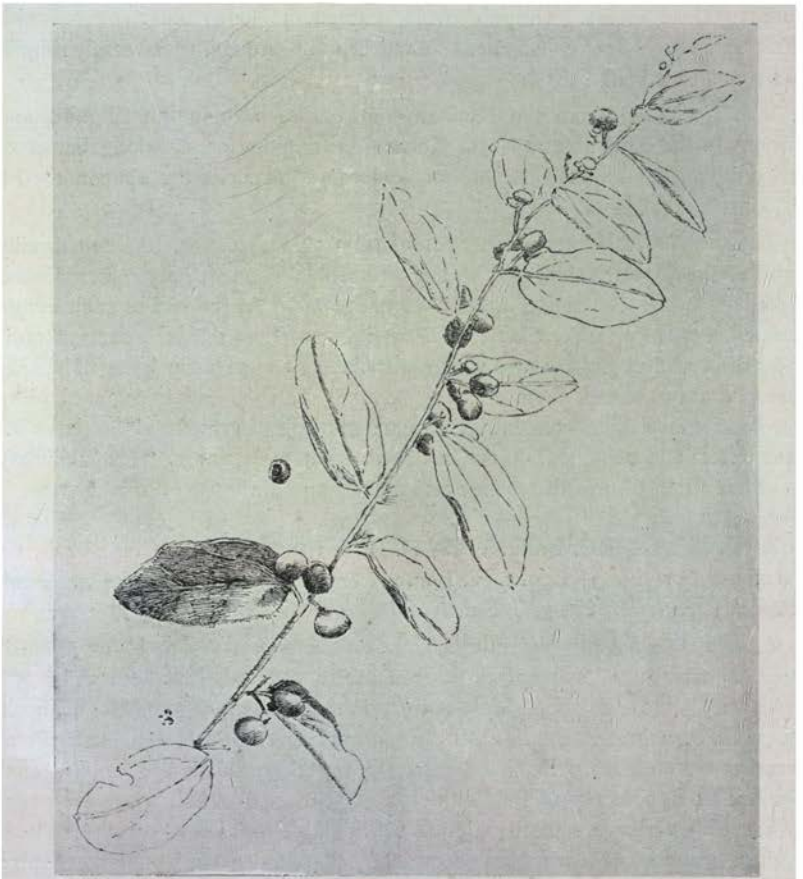


Fig 26. Cocculus villosus, DC.

3. C. Leæba, DC. Prodr. 1, 99; Fl. Br. I. 1, 102; Brandis For. Fl. 9; Gamble Ind. Timb. 26; Cooke Fl. Bomb. Pres. 1, 21. *Ullarbillar*, Sind.

A stout climber; branches striate, glabrous; branchlets long, slender puberulous. Leaves glabrous, variable, linear-oblong or trapezoid, entire or lobed, 3-5 basal-nerved; blade 1″-1·5″ by ·5″-·75″; petioles slender, ·25″ long, glabrous. Flowers axillary, small, fascicled on hairy, woody tubercles. Females solitary or twin on slender, axillary peduncles. Ovaries 3. Males in dense fascicles. Petals deeply emarginate. Drupes small, ·1″ to ·2″ in diameter, obovoid, compressed; style-scar basal.

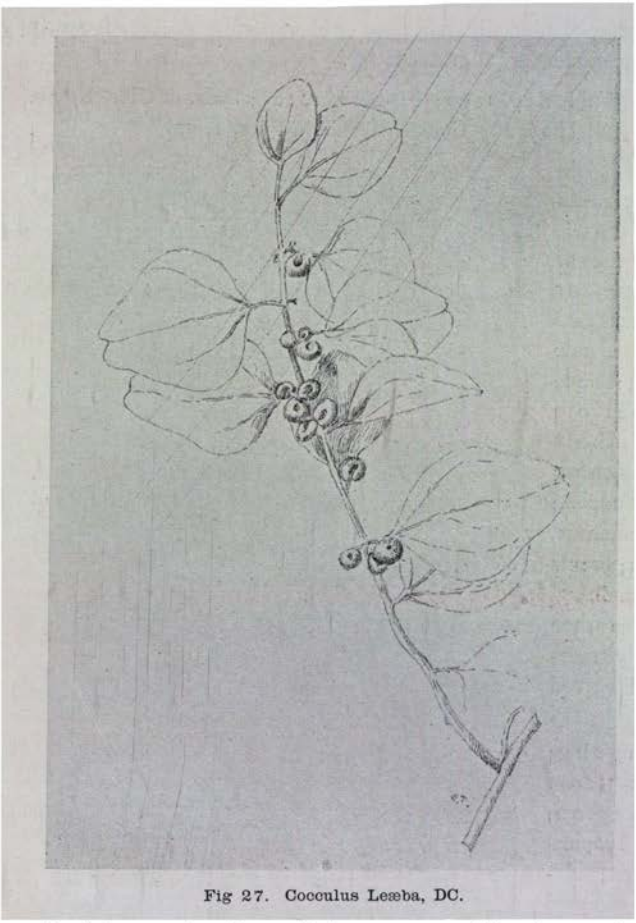


Fig 27. Cocculus Leæba, DC.

Dry and arid desert and semi-desert regions of India, Punjab, Sind, the Carnatic, Guzerat and the Deccan; common in Poona, Ahmednagar and Nasik districts; dry regions of Africa. Flowers throughout the year.

Stems up to 3′-4′ in girth. Bark corky, yellowish brown, longitudinally grooved. The structure of the wood somewhat resembles that of "*Avicennia*" as the concentric rings anastomose. The pores are very large and there are large pith like masses of tissue at the ends of the wood wedges which are separated by the very broad, medullary rays.

Used as a substitute for "*Anamirta Cocculus*" berries.

5. STEPHANIA, Lour.

Twining shrubs with peltate leaves. Flowers in axillary, cymose umbels, very deciduous. Male fl.: Sepals 6-10, free, 2-seriate. Petals 3-5, much smaller than sepals, obovate, fleshy. Anthers 6, connate at top of the staminal column, transversely dehiscent. Female fl.: Sepals 3-5. Petals of the male. Ovary 1; style 3-6-divided. Drupe ·3″ in diameter, ovoid, glabrous, red; endocarp com-

pressed, horse-shoe shaped, dorsally tubercled; sides perforated; seed nearly annular; cotyledons long, slender, adpressed.

S. hernandifolia, Walp, Rep. 1, 96; Fl. Br. I. 1, 103; Dalz. & Gibs. Bomb. Fl. 6; Gamble Man. Ind. Timb. 26; Cooke Fl. Bomb. Pres. 1, 22.

A slender-stemmed, glabrous climber; branchlets striate. Leaves peltate, thinly coriaceous, ovate or sub-deltoid, acuminate or obtuse, mucronate, truncate or cordate at the base, pale or glaucous beneath; blade 2″-6″ in diameter; petiole 1·5″ to 4″ long. Umbels capitate on axillary, slender, glabrous, 1″ long peduncles; pedicels short, numerous, thickened at the tops; bracts subulate. Drupe small, ·3″ in diameter, ovoid, red when ripe; endocarp deeply transversely ridged; seed curved nearly into a ring.

Nepal to Chittagong; Western Peninsula from the Konkan to Ceylon; Malay Peninsula; Tropical Australia and Africa; Nilghiris up to 7000′; common throughout the Konkan, Deccan and North Kanara in moist situations, often in hedges. Fl. Aug. Fr. Oct.

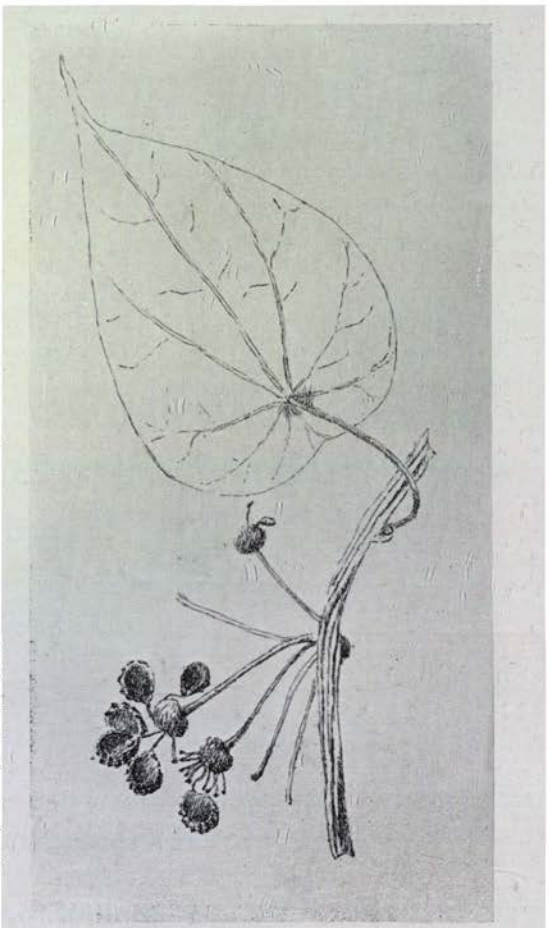


Fig 28. Stephania hernandifolia, Walp.

6. CISSAMPELOS, Linn.

Climbers. Leaves often peltate. Male fl. in lax cymes. Sepals 4. Petals 4, connate, forming a 4-lobed cup. Stamens monadelphous; anthers united

into a peltate disk, bursting transversely. Female fl. racemed in the axils of leafy bracts. Perigonium of 2, 2-nerved sepals, adnate to the bracts. Carpel 1; style short, 3-toothed. Drupe circular; style-scar near the base; endocarp horse-shoe shaped, dorsally tubercled; sides excavated; embryo linear; cotyledons adpressed.

C. Pareira, Linn. Fl. Br. I. 1, 103; Dalz. & Gibs. Bomb. Fl. 5; Brandis For. Fl. 10; Gamble Man. Ind. Timb. 26; Cooke Fl. Bomb. Pres. 1, 22. *Paharvel, paharmul,* M.; *Padavali,* K.

A small, woody, twining shrub. Leaves orbicular, reniform or cordate, sometimes broader than long, usually peltate, obtuse, and mucronate, grey pubescent, 1″-4″ in diameter; petiole 1″-4″ long. Flowers small, ·25″ across, yellowish. Male fl. in axillary racemes with a few small bracts; peduncles filiform, ·75″ long. Sepals 4, hairy outside, obovate, concave. Petals combined into a cyathiform corolla, glabrous within, half the length of the sepals. Fem. fl. in 1″-2″ long racemes with broad, alternate, foliaceous, orbicular or reniform bracts which are often densely imbricate and softly villous. Drupe ·5″ long, scarlet; endocarp transversely ridged and tuberculate; seed curved.

Throughout tropical and sub-tropical India, from Sind to Ceylon, absent from the arid desert parts of Sind and the Punjab, I have not observed it in North-Kanara but found it common on the Bababuden Hills of Mysore in monsoon-forests at about 3000′ elevation. Mr. M. Woodrow observed it in the Poona district near Junnar and also on the ghâts near Khandalla. Fl. Mar.-Oct.

" Wood brown, divided by broad med. rays and concentric bands of similar tissue into small rectangular divisions, each with 2-8, large pores as in *Cocculus* but more distant." " It yields a strong fibre. The leaves and roots are used medicinally." Gamble.

7. CYCLEA, ARNOTT.

Woody twiners. Leaves usually peltate. Flowers in axillary panicles. Male fl.: Sepals 4-8, connate into an inflated, globose calyx. Petals 4-8, connate. Anthers 4-6, connate into a peltate disk, crowning the staminal column, bursting transversely. Female fl.: Sepal 1. Petals 1, orbicular. Carpel 1; style short, 3-5-lobed, lobes radiating. Drupe ovoid, hairy; endocarp horse-shoe shaped, dorsally tubercled; sides 2-locellate.

Calyx subglobose, 6-8 toothed. Corolla urceolate...1. C. Burmanni.

Calyx campanulate, 4-lobed. Corolla a 4-lobed cup...2. C. peltata.

1. C. Burmanni, Miers Contrib. 3, 239. t. 121; Fl. Br. I. 1, 104; Dalz. & Gibs. Bomb. Fl. 6; Cooke Fl. Pres. Bomb. 1, 23. *Pakur,* Vern.

A small twining shrub with slender stems. Leaves thinly coriaceous, peltate, elongate, deltoid, sometimes sinuate below the middle, acuminate; base cordate

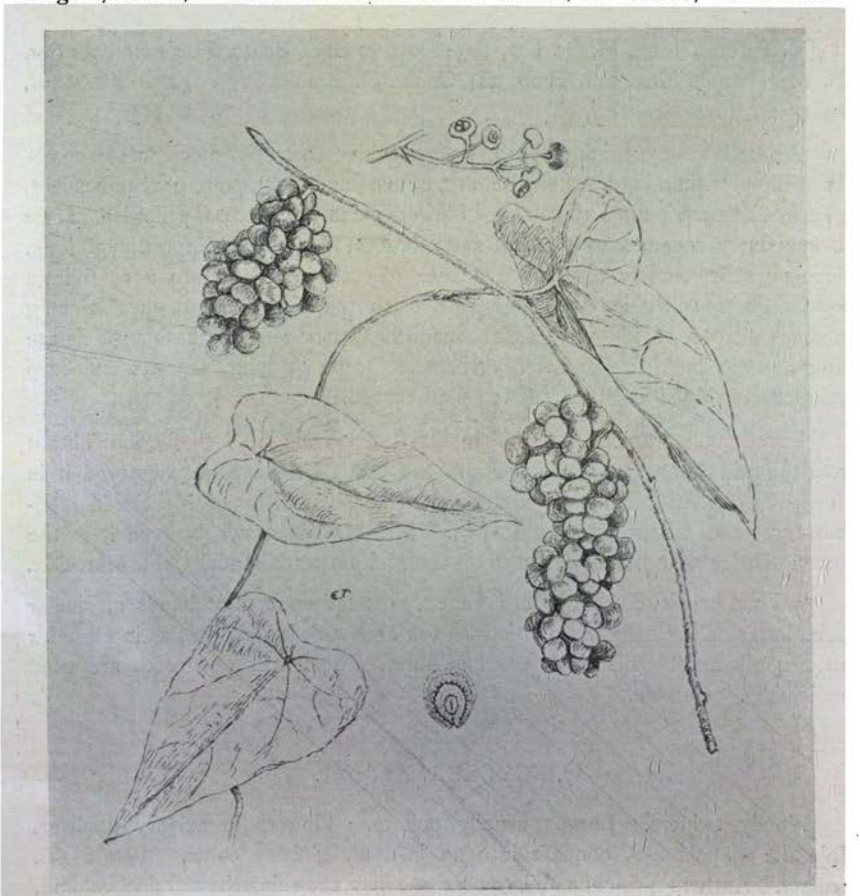


Fig 29. Cyclea Burmanni, Miers.

or sub-repand, shining above with a few scattered hairs, pubescent beneath; blade 2″-4″ by ·75″-2″; petiole hairy, ·5″ to 1·25″ long. Panicles as long as or exceeding the leaves, many-flowered, pubescent. Male flowers very caducous, twice as large as in the following species. Calyx inflated, 6-8 toothed, hairy without, glabrescent within. Corolla urceolate, half as large as the calyx and

sub-entire. Fem. flowers in axillary racemes as long as the petiole. Sepal 1, suborbicular, hairy outside. Petal 1, orbicular, adnate to base of sepal. Ovary pilose. Drupe small, pilose.

Western Ghâts and the Konkan, common in moist monsoon and rain-forests. Flowers Jan.

2. C. peltata, H. f. &. T. Fl. Ind. 201; F. Br. I. 1, 104; Dalz. & Gibs. Bomb. Fl. 6; Cooke Fl. Pres. Bomb. 1, 24. *Paryel*, M.

A twining shrub with grooved, sparsely hairy or glabrate branches and slender stems. Leaves peltate, deltoid, acute or sub-acute, mucronate, slightly cordate at the base, thinly coriaceous, smooth above, pubescent beneath, edges sub-repand; blade 3″-6″ by 2″-4″; petiole 1″ to 2.5″ long. Panicles equalling or exceeding the leaves; female flowers shorter than the males. Calyx much exceeding the corolla, 4-lobed. Corolla an irregularly 4-lobed cup. Female flowers in panicles, much shorter than the male. Sepal oblong, glabrous. Petal orbicular, much shorter than the sepal. Ovary pilose. Drupe small, pilose.

From Assam and the Khasia Hills eastwards; Eastern and Western Peninsulas and Ceylon; in the Konkan and North Kanara moist monsoon-forests from the sea-level upwards. Fl. R. S. Fr. Jan.

Order VI.—CAPPARIDACEÆ.

Herbs, shrubs or trees, erect or climbing. Leaves alternate, simple or palmately 3-9-foliate. Flowers usually bisexual, regular or irregular, axillary, fascicled, solitary, or in terminal corymbs or racemes. Sepals 4, free or connate. Petals 4, rarely 2 or 0, hypogynous or seated on the disk, imbricate or open in bud. Stamens indefinite, 8, 6, or 4, at the base of or on a long or short gynophore. Disk 0 or tumid or lining the calyx-tube. Ovary sessile or stalked, 1-celled; style short or 0; stigma depressed; ovules indefinite, parietal. Fruit capsular or berried. Seeds angled or reniform, exalbuminous; embryo incurved.

Climbing unarmed shrubs.

Fruit moniliform, a long fleshy berry ... .. 1. Mærua.

Fruit cylindric, dehiscent ... ... 2. Cadaba.

Mostly erect or climbing shrubs, armed with stipular spines. Leaves simple ... ... 3. Capparis.

An unarmed tree. Leaves digitately trifoliate... ... 4. Cratæva.

1. MÆRUA, Forsk.

Climbing shrubs. Leaves simple. Flowers corymbose. Calyx-tube lined by a disk; lobes 4, valvate. Petals 4, smaller than the calyx-lobes, ovate, inserted on the edge of the disk. Stamens numerous, inserted high on the gynophore; filaments exserted. Ovary long stalked, 1-celled; ovules many, on 2-4, parietal placentas. Berry fleshy, subglobular or moniliform, 1 or more seeded; cotyledons convolute, fleshy.

M. ovalifolia, Cambess. in Jacq. Voy. Bot. 23, t. 24; Cooke Fl. Pres. Bomb. 1, 41; *M. arenaria,* H. f. & T. Fl. Br. I. 1, 171. *Niebhuria oblongifolia,* DC.; Dalz. & Gibs. Bomb. Fl. 8; Gamble Ind. Timb. 31.

A large, woody, unarmed climber with smooth thin, reticulated bark and pubescent or glabrous branches. Leaves ovate, elliptic, obtuse or acute, apiculate, glabrous, sometimes glaucous; blade ·5″-2″ by ·25″-·75″; petioles stout, ·25″-·5″ long. Flowers greenish-white, about 1″ in diameter, in axillary or terminal corymbs. Calyx ·5″ long, ovate, hooded at the apex and with a short horn behind the hood. Calyx-tube ·15″ long, lined with the truncate disk. The columnar torus slighty exceeds the calyx-tube. Petals ovate, acute, half the

length of the calyx-lobes and alternate with them. Stamens numerous, inserted on the gynophore. Gynophore ·75″ long. Ovary cylindric, truncate; stigma large. Fruit 2″-5″ long, brown, forming a lobed, twisted berry; each lobe containing a seed. Seeds brown, globose, echinate.

Western Himalaya and Central India. Abundant in the dry regions of Western India, Dharwar, Guzerat and generally thoughout the Deccan districts in hedges; absent from the Konkan and North Kanara. Fl. and Fr. C. S.

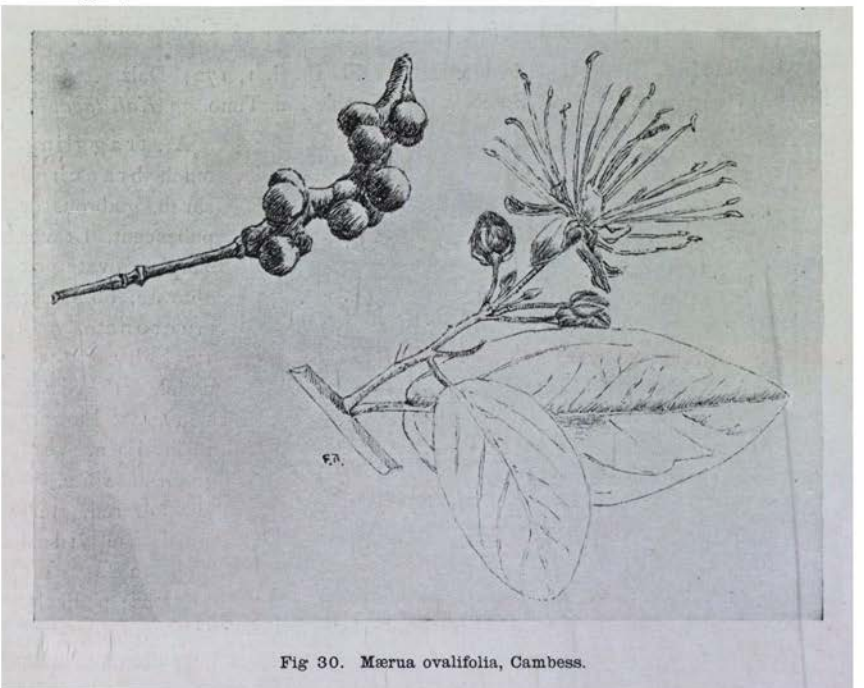


Fig 30. Mærua ovalifolia, Cambess.

Wood white, divided by concentric bands of anastomosing, corky tissue. Pores small, scanty, radially disposed between the fine regular medullary rays and with one or more intervening rays.

2. CADABA, Forsk.

Unarmed shrubs or trees. Leaves simple or trifoliate. Flowers solitary, corymbose or racemed. Sepals 4, unequal; the two outer valvate. Petals 4-2-0, clawed, hypogynous. Disk-process spathulate, excentric, with a tubular claw. Stamens 4-6, unilateral; filaments filiform, exsert-d, spreading. Ovary

long-stalked, 1-celled; ovules many, on 2-4 parietal placentas; stigma sessile. Fruit fleshy, cylindric, indehiscent or tardily dehiscent by two valves; seeds subglobose, numerous.

Straggling shrubs.

Stamens 4. Fruit dehiscent.... .... 1. C. indica.

Stamens 5. Fruit indehiscent .... 2. C. farinosa.

A small rigid tree, Stamens 5. Fruit unknown .... 3. C. heterotricha.

1. C. indica, Lamk; DC. Prodr. 1. 244; Fl. Br. I. 1, 172; Dalz. & Gibs. Bomb. Fl. 9; Cooke Fl. Pres. Bomb. 1, 43; Gamble Ind. Timb. 33. *Kali taka*, M.

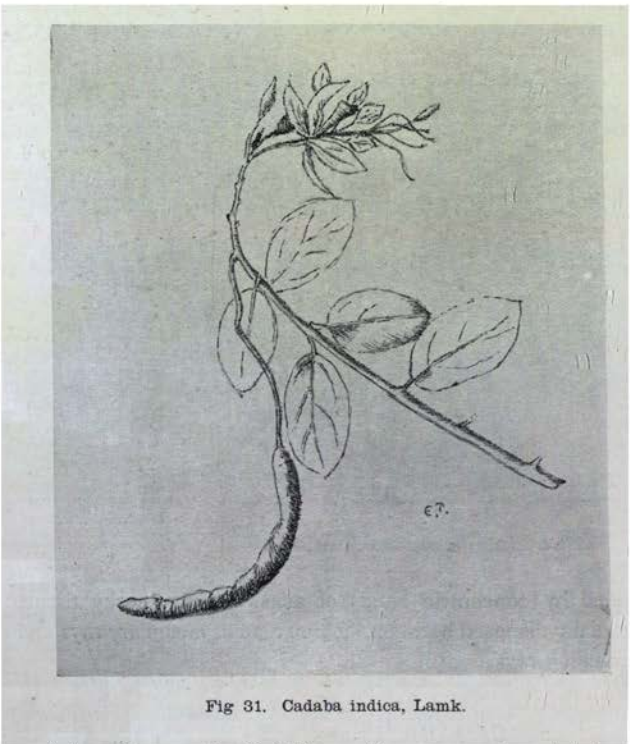


Fig 31. Cadaba indica, Lamk.

A straggling, much branched shrub, glabrous or pubescent. Leaves simple, ovate or obovate, obtuse or mucronate, ·75″-1·75″ by ·3″-·5″; petiole ·1″ long, slender. Flowers 1″ in diameter, greenish white, in few-flowered, terminal, one sided racemes or corymbs; pedicels, bracteate, ·3″-·75″ long; bracts small, subulate, Sepals ovate, acute, ·6″ long. Petals with narrow claws exceeding the sepals. Disk-process funnel-shaped, smooth, fimbriate. Stamens 4, inserted ½ way up the gynophore, exserted. Fruit cylindrical, irregularly torulose, 1″-1·5″ by ·2″, 2 valved, white inside; seeds kidney-shaped, striate, immersed in a copious orange-red, arillate pulp.

Southern India; Ceylon, very rare; Western Peninsula from Guzerat

southwards; throughout the dry districts of the presidency, often in hedges, on old walls and barren places. Flowers throughout most of the year.

2. C. farinosa, Forsk; DC. Prodr. 1, 224; Fl. Br. I. 1, 173; Cooke Fl. Pres. Bomb. 1, 43.

A straggling, much branched, wiry shrub. Leaves ovate or oblong, obtuse, glaucous or whitish and mealy at first, at length glabrate, about ·5″ long; petioles ·1″ long. Flowers as in *C. indica*. Petals 4; limb narrow, spathulate. Stamens 5. Fruit subterete or slightly torulose, doubtfully indehiscent, ·5″-1·5″ long; seeds kidney-shaped, compressed.

Dry places in the Punjab at Multan and in Sind. Brandis does not mention either this or the following species in his "Forest Flora." I have taken their descriptions from the Fl. Br. I., as I am personally unacquainted with either of them.

3. C. heterotricha, Stocks in Hook. Ic. Pl. t. 839; Fl. Br. I. 1, 173; Cooke Fl. Pres. Bomb. 1, 43.

A small, rigid, branched tree, 10′-20′ high; young parts often glandular, glaucous and pulverulent. Leaves broad, obovate or orbicular, 1″ long. Flowers ·5″ in diameter, in dense terminal corymbs. Sepals ovate, acute. Petals 4; limb suborbicular, equalling the claw. Claw of disk-process slender, tubular; limb small, oblong, bilabiate; lower lip truncate; upper elongate, reflexed, 2-3-crenate. Stamens 5. Ovary and gynophore glandular-pubescent. Fruit unknown.

Sind, on rocks near Cape Monze, Stocks. A very rare species.

3. CAPPARIS, Linn.

Trees or shrubs, erect or climbing, usually armed with twin stipulary thorns. Leaves simple or O. Flowers white or coloured, usually large and bracteate. Sepals 4, free, imbricate in 2 series, or the 2 outer subvalvate. Petals 4, sessile, imbricate. Stamens indefinite, inserted at the base of the long gynophore; filaments filiform. Ovary 1-celled on gynophore; stigma sessile; ovules many on 2-6 parietal placentas. Fruit fleshy, many seeded, rarely dehiscent; cotyledons convolute.

Flowers solitary, axillary, 2-3-fascicled or arranged in terminal corymbs.

Flowers 1″-3″ across, white; filaments purple. A prostrate shrub ... ... 1. C. spinosa.

Flowers 2″ across, with lower petals yellowish brown. An erect shrub ... ... 2. C. zeylanica.

Flowers 4″-5″ across, blue; lower petals with yellow basal-spots. An erect shrub ... ... 3. C. Heyneana.

Flowers 2″-5″ across, white or yellowish. An erect shrub ... ... 4. C. divaricata.

Flowers umbelled, racemed or panicled.

Flowers 1″ across, red or scarlet. A glabrous, erect tree or shrub ... ... 5. C. aphylla.

Flowers 5″ across, white. A climber with glabrous branches ... ... 6. C. Moonii.

Flowers ·75″ across, white. An erect, pubescent tree without stipular spines ... ... 7. C. grandis.

Flowers in simple umbels.

Spines straight, acicular.

Flowers ·5″-·75 across, white. Fruit globose, size of a cherry. An erect shrub ... ... 8. C. longispina.

Spines recurved.

Flowers ·3″-·5″ across, white. Fruit pisiform, black. A woody climber ... ... 9. C. sepiaria.

Flowers seriate in lines on the branches.

Flowers 1·5″-2″ across. Petals white and filaments purple. A brown, tomentose, woody climber ... 10. C. horrida.

Flowers ·3″-·5″ across, white. A glabrous climber ... 11. C. tenera.

C. spinosa, Linn. Sp. Pl. (1753), 503; Fl. Br. I. 1, 173; Brandis For. Fl. 14; Cooke Fl. Pres. Bomb. 1, 44; *C. Murrayana*, Grah. Cat. 9; Dalz. & Gibs. Bomb. Fl. 9. *Caper Plant. Kalvari*, Sindhi.

A diffuse, prostrate or trailing shrub; buds and young parts pubescent or frequently covered with, soft, caducous, white, green, or yellowish tomentum; stipulary thorns yellow, hooked or nearly straight. Leaves orbicular or broadly ovate, entire, mucronate, 1″-2″ in diameter; petioles ·3″ long. Flowers 1″-3″ across, white, large and showy, axillary, solitary; pedicels 1″-2″ long, thickened in fruit. Filaments long, slender, purple. Ovary on a slender, filiform gynophore. Fruit 1″-3″ long, many-seeded, oblong, ribbed, on a stout gynophore bent downwards when ripe, irregularly dehiscent, crimson inside; seeds numerous, reniform.

Var. *galeata,* is found in Arabia. Africa and Sind near the sea coast, along salt-water creeks; it has glabrous, fleshy leaves and the anticous sepals very saccate. Var. *vulgaris*, the common Indian form has the young parts covered with white pubescence.

South Europe, North Africa and Western Asia, Punjab, Sind, Guzerat, N.-W. Himalaya, ascending to 12,000′; Western Peninsula, "Mahableshwar, and in nalas and rivers along the ghâts as far north as Malsej." Dalzell; Sind and Guzerat, on dry rocks and stony hills. Very variable in the amount of pubescence, shape and consistence of leaves. Root thick, woody. Fl. Apl.-June. Fr. Nov.

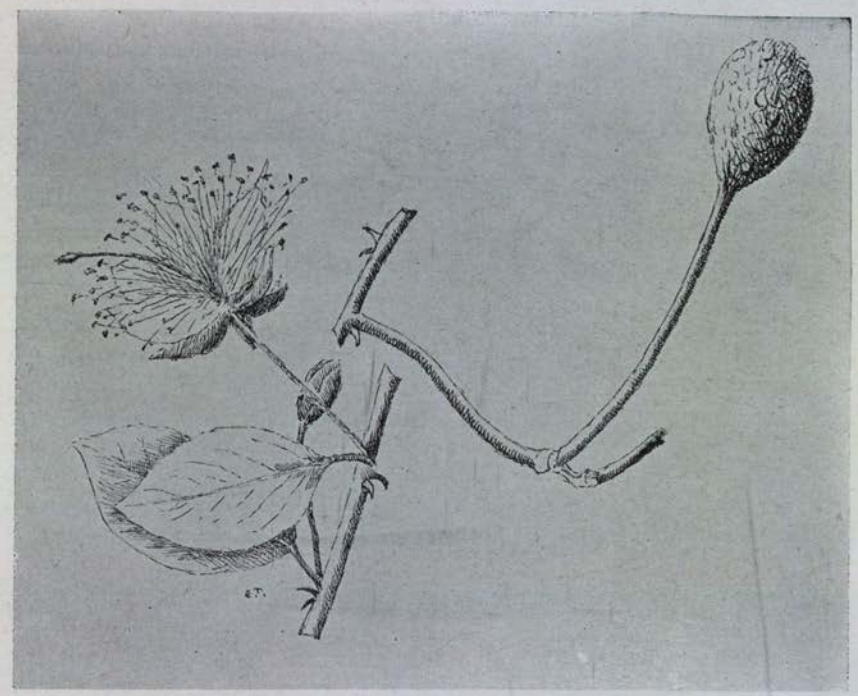


Fig 32. Capparis spinosa, Linn.

The pickled buds are the *Capers* of Europe. The ripe fruits are used in India (Sind and the Punjab) raw or pickled. **Leaves** and ripe fruits are a favourite fodder of goats and sheep.

2. C. zeylanica, Linn. Sp. Pl. (1762), 720; Fl. Br. I. 1, 174; *C. brevispina,* DC. Prodr. 1, 246; W. & A. Prodr. 24; Dalz. & Gibs. Bomb. Fl. 9; Cooke Fl. Bomb. Pres. 1, 45.

A rigid, wiry, branched shrub. Leaves ovate, acute, mucronate, coriaceous, shining above, glabrous and paler beneath; midrib prominent beneath, 1·5″-3″ by ·5″-1·5″; petiole ·15″ long; stipulary thorns very short, straight. Flowers large, white, about 2″ in diameter, solitary or 2-3 together on a short shoot; pedicels slender, about 1″ long. Sepals nearly equal, very concave. Petals ·8″ long, white, oblong, obtuse; the lower yellowish, changing to red brown. Gynophore as long as the stamens. Ovary oblong, tomentose; ovules numerous; stigma capitate. Fruit globose or irregularly ovoid, smooth, bright scarlet, 1″-2″ in

diameter; seeds numerous, imbedded in a white creamy, fœtid pulp, subreniform with a thin, brittle, dark-brown testa.

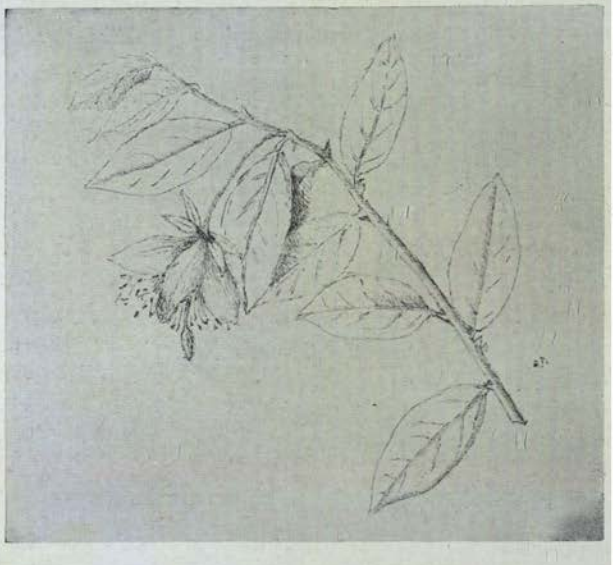


Fig 33. Capparis zeylanica, Linn.

Common in the Carnatic and Malabar and in the dry parts of Ceylon. Very rare in the Bombay Presidency. Dalzell states in 'The Bombay Flora' that it is found in the Western Deccan and Konkan, banks of nallahs etc. near Vingurla and is called *Wagutty* by theM ahrattas. This name is however in common use for *Capparis horrida*, and other climbing and erect species of the same genus. No other collector has I think found *Capparis zeylanica*, in the Bombay Presidency since Dalzell's time. The fruiting specimens collected by Mr. M. Woodrow near Alandi in the Poona district belong to a form of *C. horrida*, and are certainly not from *C. zeylanica*.

3. C. Heyneana, Wall. Cat. 6985; Fl. Br. I. 1, 174; Cooke Fl. Pres. Bomb. 45; *C. formosa,* Dalz. & Gibs. Bomb. Fl. 9. *Chayruka,* H.

An erect, much branched, evergreen shrub with minute, straight, stipulary thorns; young parts red, floccose. Leaves ovate, lanceolate, acute, coriaceous, dark green, shining above, reddish, strongly ribbed and veined beneath; blade 3″-6″ by ·5″-3″; petiole about ·4″ long, stout. Flowers large, 3″ across, solitary or in terminal, bracteate, short racemes; bracts linear, red, tomentose; pedicels 1·5″ long. Petals pale-blue or white, the lower two each with a yellow spot at the base. Filaments as long as the petals. Gynophore 1″-1·5″ long. Ovary tomentose. Fruit ovoid, beaked, size of a large olive.

Western ghâts from the Konkan to Travancore in evergreen rain-forests,

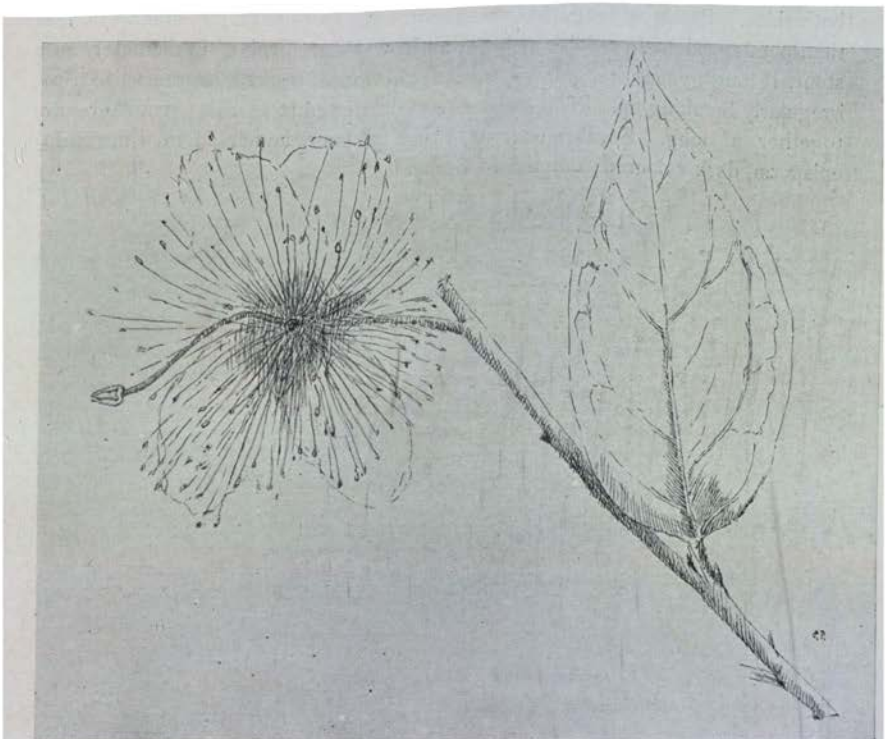


Fig 34. Capparis Heyneana, Wall.

probably endemic. A handsome, ornamental foliage and flowering shrub. Fl. March-May. Fr. R. S. The leaves and flowers are used in native medicine. Wood yellowish-pink, smooth, hard, close-grained. Pores small, single or in rows of 3 or 4. Medullary rays fine, very close together. Weighs about 45 lbs. to the cubic foot.

4. C. divaricata, Lamk.; DC. Prodr. 1, 252; Fl. Br. I. 1, 174; *C. stylosa*, DC.; Wall. Cat. 6, 980; Dalz. & Gibs. Bomb. Fl. 10; Bedd. Fl. Sylv. 13; Cooke Fl. Pres. Bomb. 1, 45; Gamble Ind. Timb. 34. *Revdi,* K. *Pachunda,* M.

An erect shrub or small tree with strong, stipular, hooked or straight thorns and hoary, zigzag branches. Leaves coriaceous, linear or ovate-lanceolate, mucronate, glabrous, rounded at the base; blade 2″ by ·2″; petiole ·3″ long. Flowers axillary, white or yellow, 1·5″-2″ across; peduncles ·5″ long; buds ovoid, beaked, brown tomentose. Sepals ·5″ long, ovate acute, thick, tomentose on

both sides. Petals ·8″ long, thin, deciduous, long spathulate. Filaments longer than petals, yellowish, reddish at base; anthers white. Fruit 2″ in diameter, on a stout, 1″ long gynophore, globose, warted, 5-6-ribbed, beaked, scarlet when ripe, irregularly breaking up. The twisted and bent peduncle and gynophore are together 2″ long. Seeds numerous, ovoid ·5″ long, immersed in white pulp; episperm, dark coloured; cotyledons fleshy.

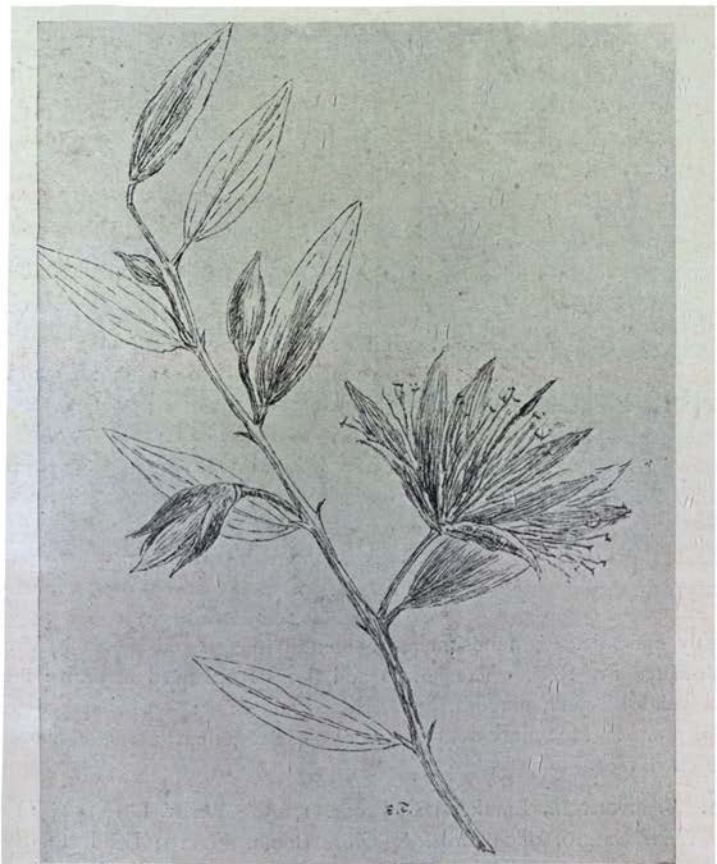


Fig 35. Capparis divaricata, Lamk.

The Deccan and Carnatic, at Tanjore and Coimbatore; dry districts of Ceylon, apparently very rare. Common all over the Deccan both on stony ground and on black soil in "Babul" thorn-forests. Fl. Feb.-March. Fr. ripe

Aug. Bark of young trees green, turning rough and dark coloured in age, 1″ thick. Wood white, hard. Pores moderate sized, scanty. Medullary rays fine, clear, not equally distant and with faint concentric lines across them.

5. C. aphylla, Roth; DC. Prodr. 1, 246; Brandis For. Fl. 14; Bedd. Fl. Sylv. 13; Dalz. & Gibs. Bomb. Fl. 9; Fl. Br. I. 1, 174. *Shiprigidda*, K.; *Kiral*, Sind.; *Ker*, Guz.; *Kera*, M.

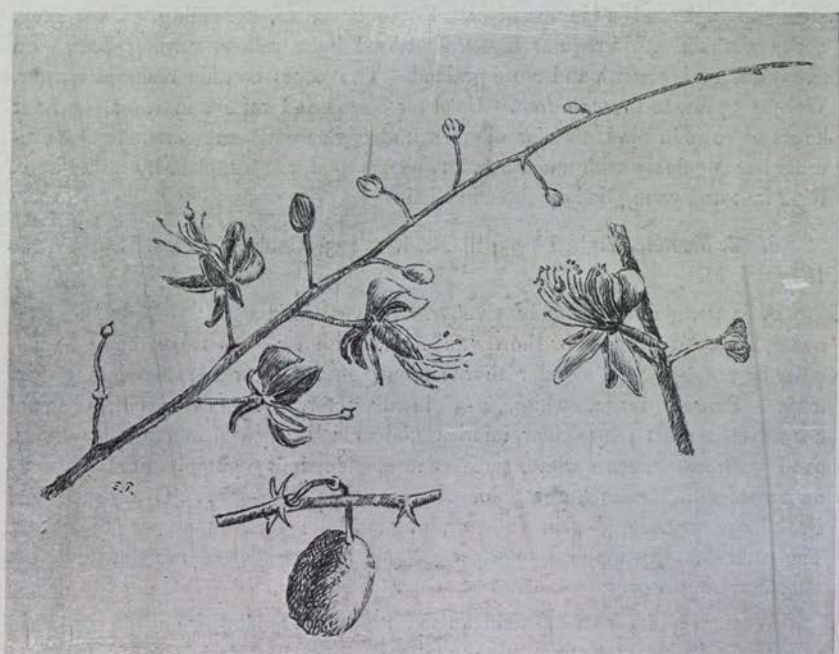


Fig 36. Capparis aphylla, Roth.

A bush or small tree with dense, zigzag, green branches and grey, fissured bark. Pairs of axillary thorns nearly straight. Leaves (found on young shoots) linear, apiculate, thick, ·5″-·75″ long, sometimes red. Flowers reddish brown, about 1″ across, in many flowered corymbs, on short lateral shoots; buds oblique, ovoid, pointed, tomentose; pedicels about ·5″ long, slender, slightly thicker at the tip. Sepals unequal, pubescent, subvalvate; anterior sepals large, hooded. Petals scarlet, unequal, 2 anterior largest, almost included in the hooded sepal. Filaments about 15, red. Ovary ovoid, on a slender gynophore, equalling the

filaments; style subulate. Fruit globose, red when ripe, ·5″ in diameter, on a 1″ gynophore. Seeds 1-several.

Punjab, Sind, Guzerat; Deccan, in the Khandesh Akrani at 3700′ altitude and generally throughout the driest semidesert parts of the Bombay Presidency; common on alluvium along the banks of the Deccan rivers (Bhima etc.), mixed with Babul and Bher, extends to Arabia and Egypt. Fl. March-Apl. Fr. Sept-Oct. Generally a large, densely branched bush, sometimes a small tree with stems 20′ high and 2′ in diameter. Roots immense, spreading. Bark grey, corky ·5″ thick with irregular fissures. Wood light yellow, turning brown on exposure, hard, smooth and close grained. The pores contain resinous matter. Weighs 53 lbs. to the cub. foot. Used for beams and rafters in roofs, and for knees of boats in Sind, also for oil-mills and agricultural implements. As firewood burns quickly with much ash. A bitter wood, not attacked by white ants. Ripe fruit and young buds pickled in Sind.

6. C. Moonii, Wight Ill. 35; Fl. Br. I. 1, 175; Cooke Fl. Pres. Bomb. 1, 46. *Wagutti,* M.

A large, glabrous, woody climber. Leaves coriaceous, 3″-4″ by 1·25″-2″ ovate, lanceolate, obtuse or shortly acuminate with a callous tip, shining above, paler or not beneath; stipular thorns stout, short, recurved; petioles ·5″-·75″ long. Flowers large, white, 4″-5″ in diameter, in 6-12-flowered, terminal corymbs. Sepals 4, orbicular, imbricate, deciduous, hoary tomentose outside, soon glabrous. Petals white, pubescent outside, hairy within. Stamens very numerous with filaments 2″-2·5″ long. Gynophore 2″-3″ long. Ovary glabrous. Fruit large, globose, 3″-4″ in diameter, long stalked; seeds many, size of a bean. The pedicel and gynophore, together 4″ long, increase considerably in thickness after flowering is over.

Western ghâts from the Konkan southwards, ascending from the sea-level to 2,000′. In North Kanara, usually in moist evergreen rain-forests; grows on laterite near Kumpta (coast of North Kanara), also on "trap" near Khandalla (Konkan ghâts). The smooth, thin barked stems often attain a diameter of 6″ and the spines on the long branches are very sharp and strong. An ornamental plant with large, white flowers. Flowers Dec.-Apl. Fr. Hot and Rainy seasons.

C. Roxburghii, DC. Prodr. 1, 247; Dalz. & Gibs. Bomb. Fl. 9; Fl. Br. I. 1, 175. *Poorwi,* M. "On the ghats," Dalz. This species comes very close to *C. Moonii,* and seems to differ only in the size of the flowers. I am inclined to think that Dalzell could not have overlooked *C. Moonii,* which is fairly common along the ghats, whereas, *C. Roxburghii,* as figured in Wight's Illustrations t. 35, is certainly not common, if found at all in the Bombay Presidency. Wight says: "Found at the base of the Neilgherries near Metapollium, Coonoor ghat road." Probably if these species are eventually kept distinct it will be found that *C. Moonii,* is the Bombay plant and not *C. Roxburghii.* Dalzell says that the colour of the fruit of *C. Roxburghii,* is scarlet. I have only seen green fruits on our ghat species which, however, may turn scarlet when quite ripe like the fruits of several others of the genus.

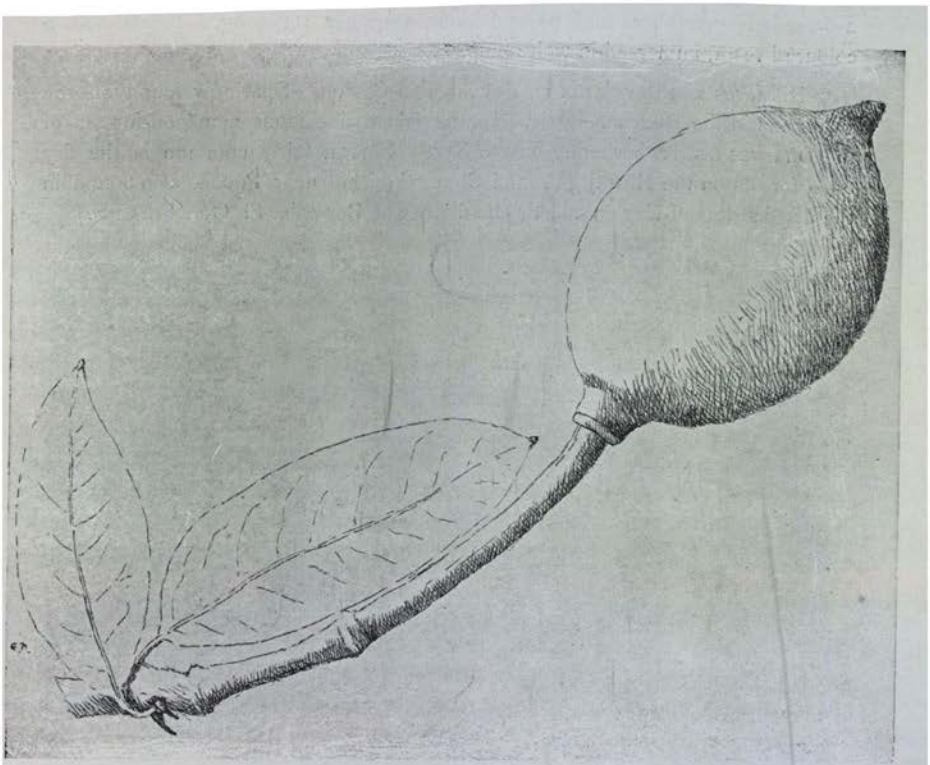


Fig 37. Capparis Moonii, Wight.

7. C. grandis, Linn. f. DC. Prodr. 1, 248; Fl. Br. I. 1, 176; Trimen Fl. Ceyl. 1, 62; Cooke Fl. Pres. Bomb. 1, 47; Dalz. & Gibs. Bomb. Fl. 10. *Kauntel,* M.; *Torate,* K.; *Puchownda,* Vern.

A small tree with tomentose branches; stipular thorns usually wanting, stout and hooked when present. Leaves coriaceous, broad-ovate, obovate, or obtuse, emarginate, mucronate, acute at the apex, cuneate at the base, clothed with olive coloured tomentum and silky beneath when young, more or less glabrescent in age; lateral nerves 8-10 pairs, rather prominent beneath and looping within the margins; blade 2″-3″ by 1·5″-2″; petiole ·5″ long. Flowers white, about 1″ in diameter in terminal, bracteate, densly pubescent corymbs; pedicels bracteate, ·75″-1″ long. Sepals 4, unequal, pubescent, pear-shaped, valvate. Petals obovate, narrow-oblique; inner surface pubescent. Gynophore ·75″ long. Ovary ovoid-acute, glabrous. Fruit subglobose, 1″ in diameter, purple, smooth,

2-6-seeded; gynophore and pedicel stout, together 1·5″ long. Seeds with a coloured testa, immersed in white pulp.

Hill forests of the Carnatic, Deccan and Ceylon. Sparingly found on the ghâts and in the Deccan.—Dalz. In the mixed deciduous monsoon-forests of the Dharwar district bordering on the North Kanara, fairly common in the dry open forests on the Katraj ghât and Chatursingi hill near Poona, also found in the dry districts of Ceylon and Prome district of Burmah. Fl. Oct. Fr. C. S.

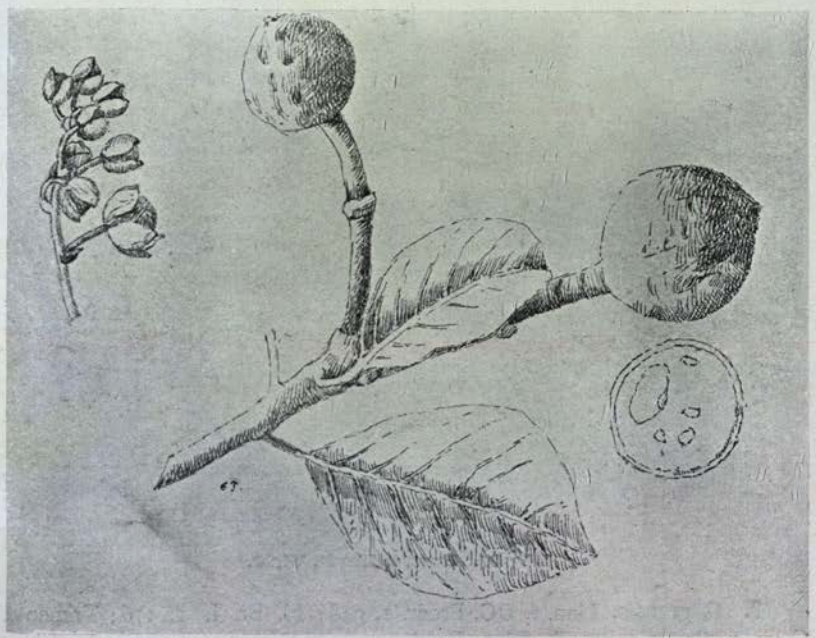


Fig 38. Capparis grandis, Linn. f.

A small tree, sometimes with a rather thick trunk, but of no great height. Bark thick, rough and corky, irregularly fissured. Wood white, moderately hard and durable, used by the natives in the Madras Presidency for agricultural implements and rafters. Weighs 46 lbs. to the cubic foot.

8. C. longispina, Hook. f. & T.; Fl. Br. I. 1, 176; *C. peduncutosa,* Wall. var. *longispina;* Cooke Fl. Bomb. Pres. 1, 48; Dalz. & Gibs. Bomb. Fl. 9.

A densely pubescent, branched shrub with a rounded crown. Leaves bifarious, broadly ovate, acute, broad and subcordate at the base, glabrous

above, pubescent beneath; blade about 1″ by ·75″; petiole ·2″ long; stipulary thorns straight, acicular, reddish coloured, ·5″ long, Flowers white ·5″ across, in sessile, terminal, simple umbels; pedicels ·75″-1″ long, filiform. Sepals ·2″ long. Petals equalling the sepals. Fruit globose, size of a pea, smooth, shining, 1-seeded; gynophore thickened at top; stalk slender 1·5″-2″ long.

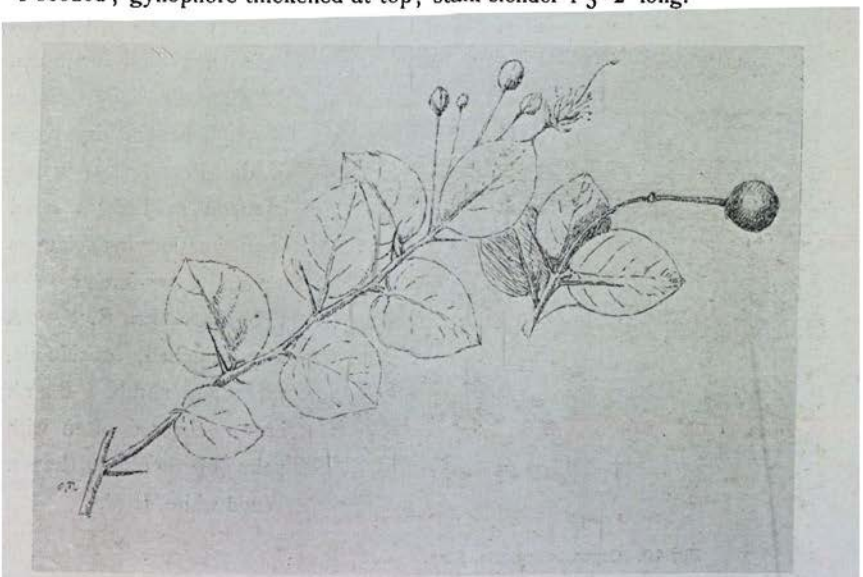


Fig 39. Capparis longispina, Hook. f. & T.

Apparently endemic in the Western ghàts of the Bombay Presidency. Along the North Kanara ghàts in open situations near evergreen rain-forests. It is also found on the laterite of the Mahableshwar plateau and on the higher hills of the Konkan. The size, shape and consistency of the leaves varies considerably. Fl. Feb.-March. Fr. R. S. A spreading, evergreen, bushy shrub. In the Fl. Br. I. it is stated that this is probably a state of *C. pedunculosa*, differing in the thorns, leaf form and pubescence.

9. C. sepiaria, Linn. DC. Prodr. 1, 247; var. *vulgaris*; Fl. Br. I. 1, 176; Brandis For. Fl. 15; Dalz. & Gibs. Bomb. Fl. 10. *Kanthar*, Guz.; *Basingi*, K. *Mastondi*, M. *Waghati*, M.

A spreading, wiry-branched shrub; branches hoary or tomentose. Leaves broadly ovate or elliptical, emarginate, pubescent beneath whilst young, glabrous in age; blade ·75″-1·25″ by ·5″-·75″; petiole pubescent or tomentose ·2″ long;

stipulary thorns recurved. Flowers white, ·25″ across, in many flowered, sessile or shortly peduncled umbels; pedicels ·1″ slender; buds globose. Sepals oblong. Petals narrow. Gynophore filiform, ·4″ long. Ovary ovoid, pointed, glabrous. Fruit on slender 1″, stalks, size of a pea, smooth, black, 1-seeded.

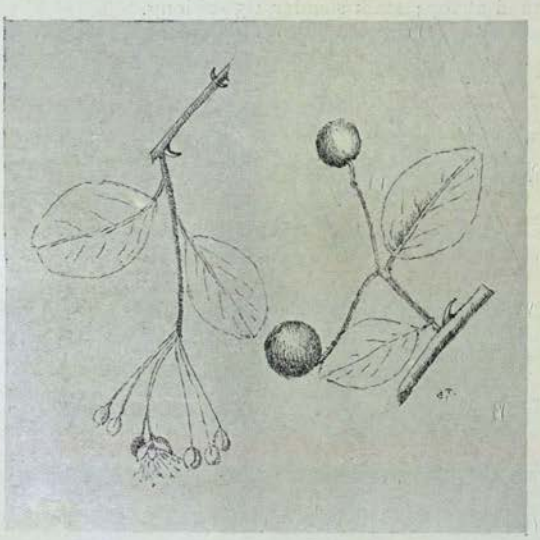


Fig 40. Capparis sepiaria, Linn.

Dry places throughout India from Sind to Burma, the Carnatic and Ceylon. Throughout the dry parts of the Presidency; very common in hedges and open situations in deciduous open thorn-forests. Fl. Feb.-May. Fr. R. S. A wiry-branched, deciduous, spreading shrub. Bark brown, covered often with pairs of hooked thorns. Wood white, hard.

10. C. horrida, Linn. f. DC. Prodr. 1, 246; Fl. Br. I. 1, 178; Dalz. & Gibs. Bomb. Fl. 10; Brandis For. Fl. 15. *Ardanda,* H.; *Wag, wagutty, gowindi, Tarati,* M. *Totla balli,* K.

A climbing shrub, covered when young with dense, ferruginous tomentum. Leaves ovate, oblong or elliptic, with a hard apiculum, glabrous, shining above, rufous pubescent beneath when young, glabrous later; blade 1·5″-4″ by ·75″-2″; petiole ·5″ long. Flowers 1·5″-2″ across, white with purple stamens, seriate on thick, 1″ long, pubescent, supra-axillary pedicels. Sepals ·4″ long, red tomentose, very concave. Petals ·8″ long, oblong, ciliate. Ovary glabrous, acute. Fruit 1″-1·5″ in diameter, globose, scarlet, smooth, obtusely 4-angled, red when ripe, many seeded; stalk 1·5″ long; seeds bean-shaped, ·3″ long, closely covered with a white glutinous pulp; episperm dark brown, crustaceous, smooth.

Plains and lower hills in most parts of India, Ceylon and Java; throughout the Presidency and Sind; common in hedges and in open situations from the sea-level upwards. Fl. Nov.-Apl. Fr. Aug.-Sept. Found in forests climbing high

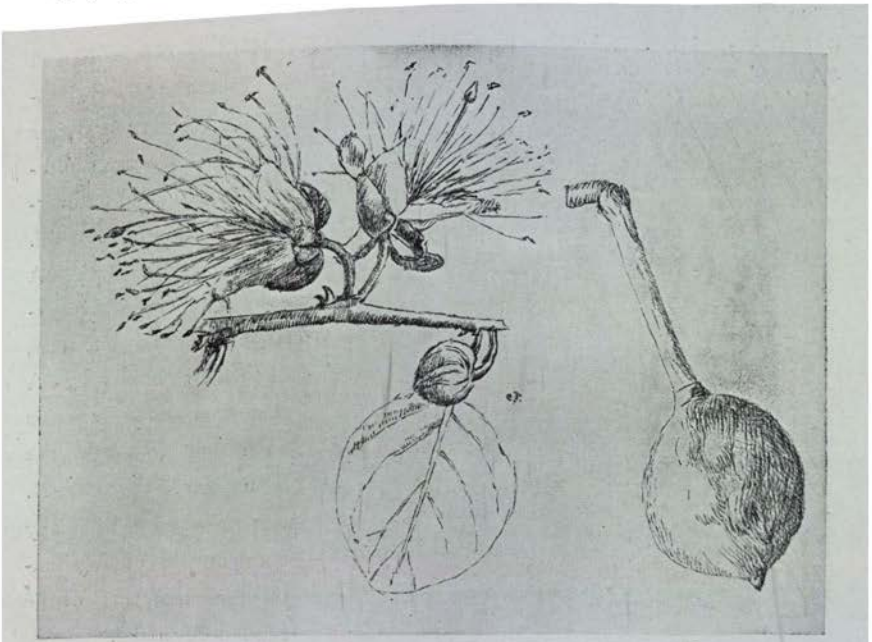


Fig 41. Capparis horrida, Linn.

and covered with its conspicuous and characteristic rufous tomentose flowers, often when bare of leaves. In specimens from the Tannah district the old leaves are quite glabrous and sometimes somewhat glaucous beneath. Wood yellowish-white, moderately hard, light. Pores large, single, often filled with a pithy substance. Medullary rays broad, wavy, numerous. Annual rings distinct. Weighs 47 lbs. to the cubic foot. Used for fuel. Leaves and bark used medicinally. Fruits sometimes used in native curries, also eaten as a vegetable in the Konkan (Tannah) districts.

11. C. tenera, Dalz. in Hook. Kew Jour. Bot. 2, 41; Cooke Fl. Bomb. Pres. 1, 48; Dalz. & Gibs. Bomb. Fl. 9; Fl. Br. I. 1, 179. Var. *Dalzellii.*

A tall, woody climber with glabrous branches. Leaves membranous, glabrous, ovate lanceolate, acuminate; blade 1·5″-3″ by ·75″-1·5″; petiole ·1″ long; stipulary thorns short, hooked, very sharp. Flowers ·5″ across, white, on slender supra-axillary pedicels about 1″ long. Sepals linear, reflexed. Petals longer than the sepals, tomentose outside. Gynophore filiform ·75″ long. Ovary ovoid, glabrous. Fruit pisiform, few, 3-4-seeded.

Fig 42. Capparis tenera, Dalz.

Hill forests from Assam to Burma and Tennaserim, Western ghâts from North Kanara, southwards to Ceylon, in evergreen rain-forests. Fl. April-May. Fr. R. S. A large climber with angular stems and glabrous, slender branches. A somewhat rare species and only found in the Southern parts of N. Kanara where it is locally abundant in open situations on the forests of the Siddapore taluka.

4. CRATÆVA, L.

Trees. Leaves trifoliate. Flowers large, yellow, in dense terminal corymbs. Sepals 4, deciduous, imbricate, cohering below with the convex disk. Petals 4, long-clawed, open in bud. Disk hemispheric, lobed, lining the bottom of the calyx. Stamens indefinite; filaments filiform, free. Ovary on a long gynophore with 2 placentas bearing numerous ovules; stigma sessile, depressed. Fruit a large berry. Seeds imbedded in pulp.

C. religiosa, Forst.; DC. Prodr. 1, 243; Fl. Br. I. 1, 172; Brandis For. Fl. 16; *C. Roxburghii*, Br. *C. Nurvala*, Ham.; Dalz. & Gibs. Bomb. Fl. 8; Bedd. Fl. Sylv. 14. *Bitusi*, *hole lakki*, K.; *Nirvala, kumla, karwan, hadwurna, waiwurna,* M.; *Varvunna*, H.

A moderate-sized, deciduous tree. Leaves trifoliate, often clustered towards the ends of the branches, long petioled; leaflets ovate, acuminate, glabrous shining above, pale beneath, 2″-5″ by ·75″-1·5″; petioles 2″ long; petiolules ·25″ long, articulate. Flowers 2″ across, on filiform pedicels. Sepals ·2″ long, petaloid, ovate, deciduous. Petals much larger than the sepals, with the claw ·75″-1″

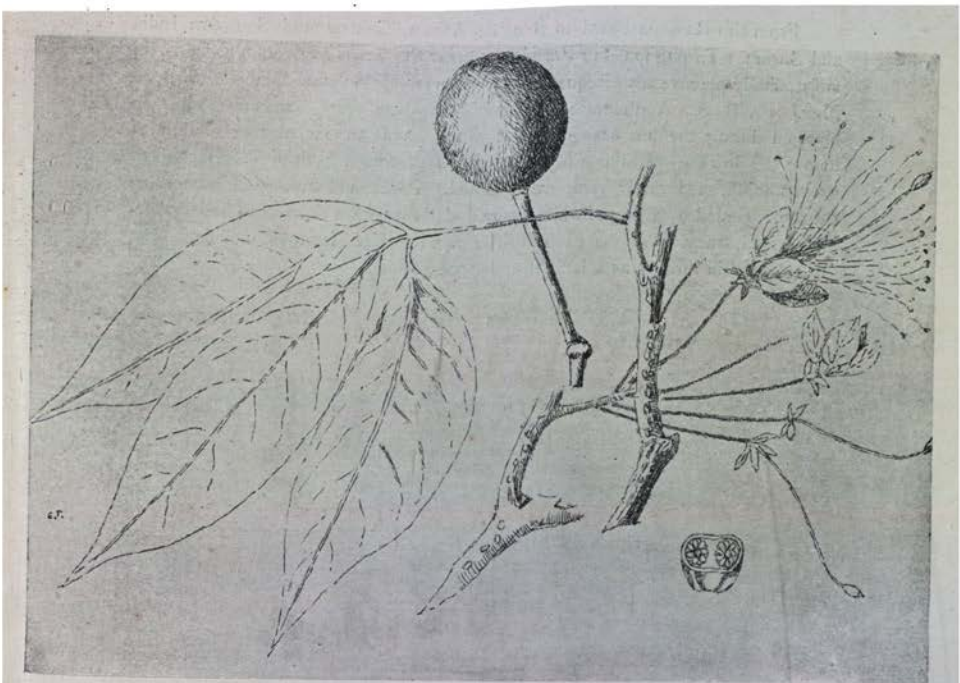


Fig 43. Cratæva religiosa, Forst.

ong; limb ovate or oblong, veined. Filaments purple, longer than the petals, inserted above the disk on the base of the filiform, 1·50″ long gynophore. Ovary 2-ribbed, ovoid; stigma sessile, discoid. Berry ovoid, woody, scurfy, 1·2″-2″ in diameter, many-seeded. Stalk stout, 1·50″-4″ long. Seeds ·25″ long, reniform, immersed in yellow pulp.

There are two varieties of this tree viz. *Nurvala,* and *Roxburghii,* which are considered distinct species by Dalzell in the Bombay Flora. Var. *Nurvala,* with ovate, lanceolate leaflets and ovoid fruit is the common form throughout the Presidency. Var. *Roxburghii.* which has much smaller, broad and abruptly acuminate leaflets and a globose fruit is found in the Warri country and along the banks of the Nerbudda river near Chandode.

From tho Ravi eastward to Bengal; Assam, Central and Southern India and Burma. Throughout the Presidency, near the banks of rivers and nalas, in moist, shady places; also frequently planted near Mussulman tombs. Fl. Apl.-May. Fr. R. S. A moderate-sized, deciduous tree, very handsome when in blossom during the hot season. The young leaves appear with or sometimes before the flowers. Attains a height of 30′ to 40′ with a girth of 6′. Bark dark grey, smooth, moderately hard, even-grained. Pores moderate-sized, numerous; each surrounded by a ring of white tissue. Medullary rays short, fine and moderately broad, wavy. Weighs 42 lbs. to the cub. ft. Used for toys, models, boxes, etc. Useful in turnery as it is light and close-grained.

Order VII.—RESEDACEÆ.

Herbs or shrubs. Leaves alternate; stipules O or minute. Flowers spiked or racemose, bracteate, often polygamous. Calyx 4-7-divided; lobes imbricate in bud. Petals 2-7, entire or lobed, open in bud. Disk often unilateral, conspicuous. Stamens numerous, free or connate, equal or unequal, inserted on the disk. Ovary 1-celled, of 2-6 connate carpels, often lobed at the top and open between the lobes which bear the sessile stigmas; ovules many on 2-6, parietal placentas. Fruit a capsule or berry. Seeds many; albumen O; embryo curved or folded.

A small "natural" order of herbs or shrubs; contains the well-known "*Mignonette*" *(Reseda odorata, L.);* closely allied to the *Capparidaceæ*, *Cruciferæ* and *Violaceæ;* of no practical interest to the forester.

OCHRADENUS, DELILE.

Branched glabrous shrubs. Leaves small, linear. Flowers minute. Calyx 5-partite. Petals O. Disk unilateral. Stamens 10-20. Ovary ovoid, closed at the top, 3-beaked; ovules many on 3 placentas. Berry many-seeded, or sometimes seeds few and large.

O. baccatus, Del. Fl. Aeg. 15. t. 1; Fl. Br. I. 1, 182; Cooke Fl. Pres. Bomb. 1, 50.

A much branched, glabrous, strong-smelling shrub, 6′-12′ high, with wiry, green branches. Leaves fleshy, scattered, linear-spathulate, ·5″-1·5″ long; stipules minute or O. Flowers minute, in rigid, 6″-12″ racemes, yellowish; pedicels slender ·1″ long. Calyx flat, rotate, 5-6-lobed. Petals O. Disk unilateral. Stamens 10-12. Berry small, ·2″, in diameter, white, obovoid; apex 3-denticulate. Seeds few, pale brown.

Found in Sind and the dry wastes of Egypt and Syria. A desert shrub. Branches bare of leaves when old. Fl. Jany.

Order VIII.—VIOLACEÆ.

Herbs or shrubs. Leaves alternate, stipulate; stipules persistent or deciduous. Flowers regular or irregular, hermaphrodite or rarely polygamous, 2-bracteolate. Sepals 5, persistent, equal or unequal, imbricate. Petals as many as the sepals, hypogynous, imbricate or twisted in bud. Stamens 5; filaments short, broad; anthers free or connate; connective broad and produced beyond the cells. Ovary sessile, 1-celled; ovules many, anatropous, attached to the 3 parietal placentas; style simple; stigma capitate, truncate or cup-shaped, entire or lobed. Fruit a 3-valved capsule, rarely a berry; albumen fleshy; embryo small, straight; cotyledons flat.

An order of little importance to the forester. Hitherto only one small, rare tree *(Alsodeia zeylanica)*, has been found in the North Kanara district.

ALSODEIA, THOUARS.

Shrubs or small trees. Leaves alternate, distichous; stipules rigid, deciduous. Flowers small, axillary or terminal, solitary, fascicled cymose or racemose, regular; peduncles with many bracts. Sepals 5, almost equal. Petals as many as the sepals, sessile. Stamens 5, inserted inside or on an annular and lobed disk; connective produced into a broad membranous appendage beyond the cells. Ovary 1-celled; ovules few or many; style straight; stigma terminal Capsule 3-valved, few-seeded.

A. zeylanica, Thwaites Enum. 21; Fl. Br. I. 1, 187; Bedd. Fl. Sylv. t. 229

A small tree or large shrub; young parts minutely puberulous. Leaves ovate or obovate, acuminate or obtuse, shining, reticulated, minutely dentate; lateral nerves 5-9 pairs, rather prominent beneath and with shallow, depressed glands ciliated on their margins in the axils; blade 2·5″-6″ by 1″-3″; petiole ·4″ long, channelled above; stipules 2, broad-lanceolate, rigid, ·5″ long, deciduous. Flowers small, ·15″ across, white, polygamous, in small, bracteolated fascicles; pedicels ·1″-·2″ long, often crowded on stout, short, recurved, scaly peduncles. Sepals ovate, acute. Petals twice as long as the sepals, recurved at the apex. Disk 5-crenate-lobed, Stamens included; filaments short, inserted on the inner edge of the disk-lobes; anthers small, yellow, sterile in the female, larger in the male flower; connective much produced and terminating in a broad shovel-shaped, reddish petaloid lobe. Ovary 3-ovuled. Capsule 3-seeded, about the size of a pea, green, reticulate, pedicelled; pedicel ·25″ long; seeds white,

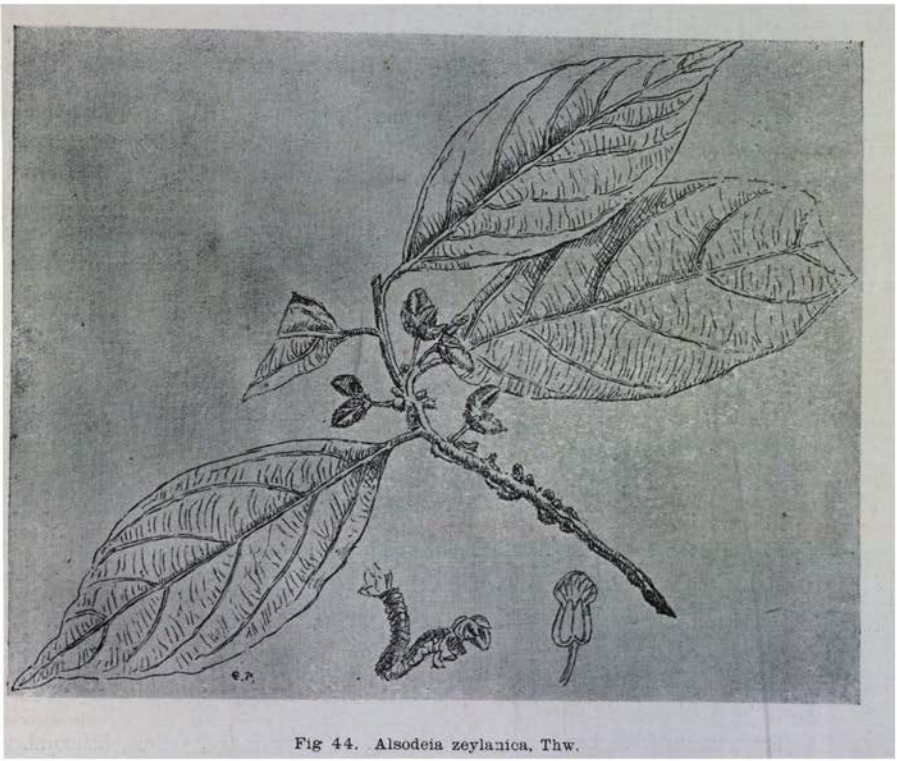


Fig 44. Alsodeia zeylanica, Thw.

glabrous. Very closely allied to *A. bengalensis*, Wall. from which it differs in having short, scaly peduncles and the flowers on shorter pedicels.

This shrub or small tree is found in the tropical evergreen rain-forests near Katgal in the Kumpta taluka, also on the Mulamune Ghát in North Kanara. Beddome found it in Travancore and in the Wynaad. It also occurs in the Ratnapoora district of Ceylon, and apparently flowers and is in fruit at different times throughout the year. A rare species of no economic importance.

Order IX.—BIXACEÆ.

Trees or shrubs. Leaves alternate; stipules minute or O. Inflorescence various. Flowers regular, 1-2-sexual. Sepals 2-6, imbricate, rarely connate, deciduous. Petals 4-5-0, imbricate or contorted in bud, deciduous. Stamens usually hypogynous, indefinite, rarely definite; anthers bursting by slits or pores. Disk thick, often glandular. Ovary 1 or few-celled; style and stigmas free or united; ovules 2 or many, parietal. Fruit dry or fleshy. Seeds arillate or with a pulpy testa, albuminous; embryo axile; cotyledons foliaceous, often cordate.

Flowers bisexual.

Petals large, broad.

Capsule 5-valved ... ... 1. Cochlospermum.

Capsule 2-valved ... ... 2. Bixa.

Petals small. Fruit a 2-4-seeded berry... 3. Scolopia.

Flowers diœcious.

Petals O. Fruit 2-8-celled and seeded... 4. Flacourtia.

Petals 5 with a scale opposite each.

Fruit many-seeded ... ... 5. Hydnocarpus.

1. COCHLOSPERMUM, KUNTH.

Trees or shrubs. Leaves digitately-lobed. Flowers large, yellow, bisexual. Sepals 5, deciduous. Petals 5, contorted in bud. Stamens indefinite, inserted on a disk, without glands. Ovary globose, with numerous ovules on 3-5 parietal placentas; style simple; stigma minutely denticulate. Capsule 3-5-valved. Seeds cochleate; testa hard, woolly; embryo curved; cotyledons ovate.

C. Gossypium, DC. Prodr. 1, 527; Fl. Br. I. 1, 190; Brandis For. Fl. 17; Bedd. Fl. Sylv. 14; Cooke Fl. Pres. Bomb. 1, 53; Gamble Ind. Timb. 37. *Gunglay, gulgul,* M., *Ganeri,* Bhil; *Bulauri,* K.

A moderate-sized or small, deciduous tree; young branches tomentose, marked with great scars of the fallen leaves. Leaves alternate, near the ends of the branches, large, on long, thick petioles, 3-5-palmately lobed; lobes acuminate, grey-tomentose beneath; blade 3″-8″ across. Flowers large, golden yellow, 4″-5″ in diameter, in few-flowered, terminal panicles. Sepals 5, unequal, silky outside, imbricated, caducous. Petals 5, deeply emarginate, contorted in

Fig 45. Cochlospermum Gossypium, DC.

bud. Stamens numerous; filaments free; anthers 2-celled, elongated, dehiscing inwardly by pores or short slits. Capsule dark brown coloured, pear-shaped, 2″-3″ in diameter, 5-valved, divided by incomplete dissepiments. Seeds numerous, covered with a soft silky wool.

Dry stony hills along the base of the North-West Himalaya from the Sutlej eastwards, dry regions of the valley of the Irawaddi in Burmah, Behar, Bundelkund, Orissa, Guzerat, and the Deccan, common on the Khandesh Satpuras on trap also in the Belgaum district on Kaladgi quartzites, cultivated in Ceylon near temples.

Usually a small tree, with short, thick, spreading branches. Bark 1″ thick, ash-coloured, smooth, fibrous, deeply fissured; inner bark red. Wood very soft. Pores large, scanty, often subdivided into compartments. Medullary rays broad, visible on a radial section as long, rough plates; weighs 27 lbs. to the cubic ft. The tree grows in the dryest and stoniest situations and is one of the few species which is able to successfully resist the fierce, annual forest fires of the Khandesh Deccan Satpuras. The fresh foliage appears in May and the large conspicuous flowers in Feb. March and April when there are no leaves. The *Gulgul* yields a clear, white gum, *Katira*, insoluble in water, used in the shoe-making and book-binding trades. The floss from the seeds makes a good stuffing for pillows even better than that from *Bombax*. The bark yields a cordage fibre. An oil is extracted from the seeds which is however very little used. Wood quite useless for economic purposes.

2. BIXA, L.

A shrub or small tree. Leaves simple; stipules minute. Flowers in terminal panicles, bisexual. Sepals 5, deciduous. Petals 5, contorted in bud. Anthers opening by 2 terminal pores. Ovary 1-celled; style slender, curved; stigma notched; ovules many, on 2 parietal placentas. Capsule softly prickly, loculicidally 2-valved; placentas on the middle of each valve. Seeds many; testa pulpy, red, (originally fleshy papillæ); embryo large; cotyledons flat; albumen farinaceous.

B. Orellana, Linn.; Fl. Br. I. 1, 190; Brandis For. Fl. 17; Dalz. & Gibs. Bomb. Fl. Suppl. 5. *Arnotto, kisri, sendri,* Vern.; *Rudgamali,* K.

A small, evergreen tree; young shoots and inflorescence rusty-puberulous. Leaves cordate, acuminate, entire or angular, 3″-8″ in diameter. Flowers in terminal panicles, large, 2″ across, purple or white. Capsule ovoid, reddish-brown, 1·5″ long, covered with long, setose, soft prickles Cultivated throughout the presidency; indigenous in America. Fl. Sept. Fr. Jany. The pulp sur-

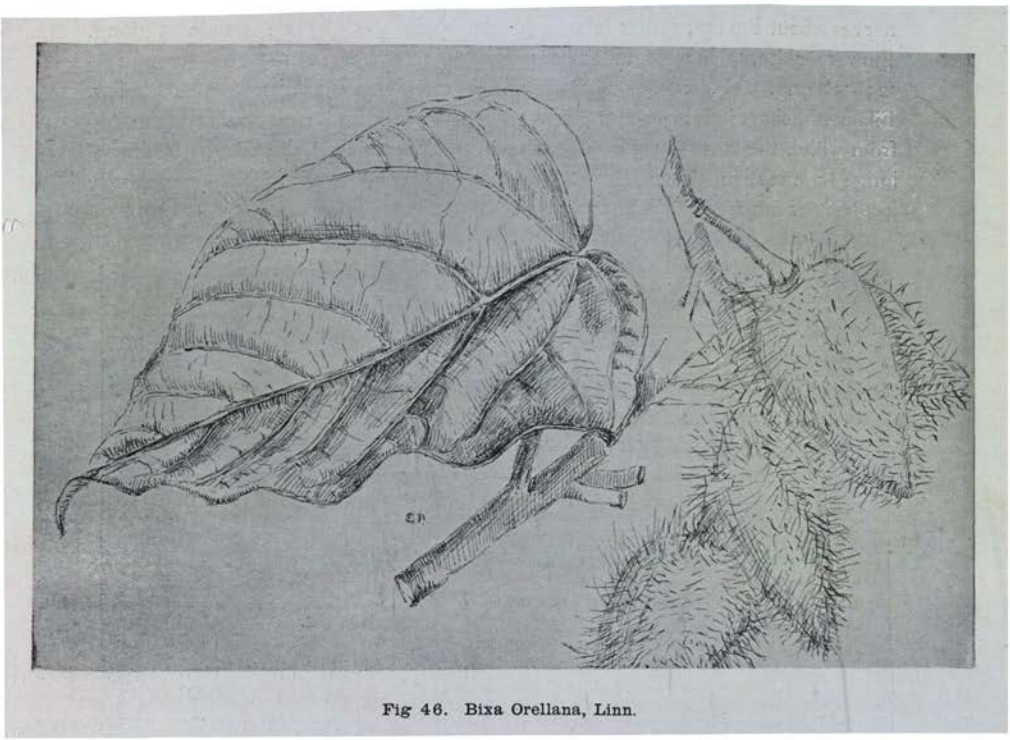


Fig 46. Bixa Orellana, Linn.

rounding the seeds *(Arnotto)* is used to colour butter and as a red or orange dye for silk fabrics. Wood pinkish-white, soft.

3. SCOLOPIA, SCHREBER.

Spinous trees. Leaves alternate, entire. Flowers in axillary racemes, small. Sepals 4-6. Petals 4-6, imbricate in bud. Stamens many, on a glandular or eglandular disk; connective produced. Ovary 1-celled; style erect; stigma entire or lobed; ovules few on 3-4 parietal placentas. Berry 2-4-seeded. Seeds with long funicles; testa hard; cotyledons foliaceous.

Scolopia crenata, Clos. in Ann. Sc. Nat. ser. 4, vol. 8, 250; Fl. Br. I. 1, 191; Bedd. Fl. Sylv. 15; *Phoberus crenatus*, W. & A.; Dalz. & Gibs. Bomb. Fl. 11; Cooke Fl. Pres. Bomb. 1, 54; Gamble Ind. Timb. 39.

A small or medium-sized, deciduous, spinous tree. Leaves coriaceous glabrous, ovate, acute, or bluntly acuminate, sub-crenate or repand; lateral

nerves about 8 pairs, rather faint beneath; blade 4″-5″ by 2″; petiole ·5″ long. Flowers white, ·5″ across, in axillary or terminal racemes, 1″-3″ long; pedicels ·25″-·5″ long. Calyx-lobes slightly imbricate in bud. Petals smaller but similar. Filaments short in bud; the 2-celled anthers form a compact dome at the top from which the stout style is exserted; in the open flower the filaments are ·3″ long; connective produced, glabrous. Style long exserted; stigma shortly 4-lobed, or notched. Fruit green, (size of a cherry) apiculate.

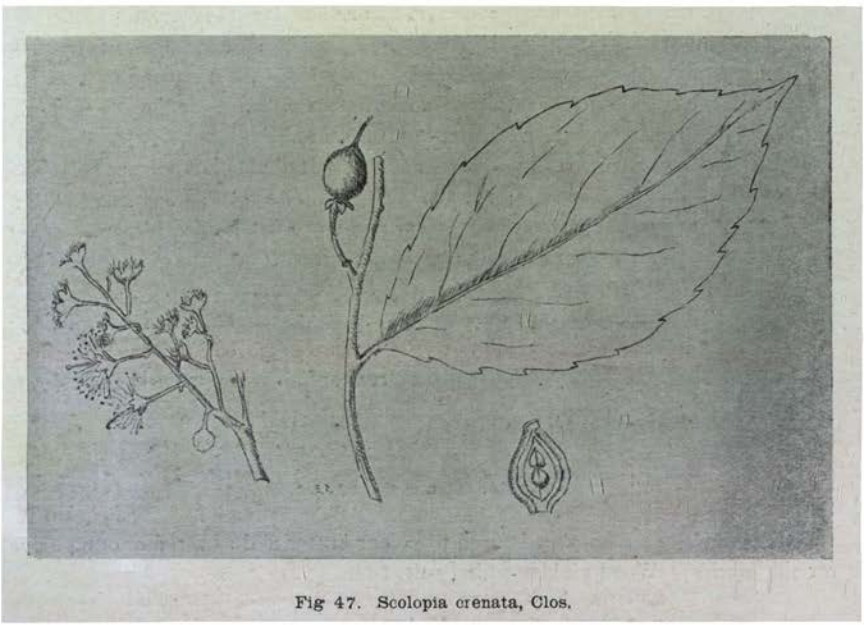


Fig 47. Scolopia crenata, Clos.

Western Ghâts from the Konkan southwards, Nilgherry sholas and in Ceylon, common on the Nilkund and Dodmune Ghâts of North Kanara in monsoon and rain-forests. Fl. March. Fr. ripe August. Spines branched. Bark rough with raised lenticels. Wood reddish brown or white, hard, dense, close and even-grained. Pores small subdivided or in short radial lines. Medullary rays fine, numerous, close. Beddome says that the wood is so hard as to resist the saw and injure tools.

4. FLACOURTIA, COMMERS.

Trees or shrubs, usually spinous; young shoots and leaves often red. Leaves toothed or crenate. Flowers small, dioecious. Sepals 4-5, small, imbri-

cate. Petals O. Stamens numerous; anthers short, versatile. Ovary on a glandular disk; styles 2 or more, distinct or connate or O; stigmas 2-notched or 2-lobed. Fruit a few-seeded berry. Seeds obovoid; testa coriaceous hard, woody; cotyledons orbicular.

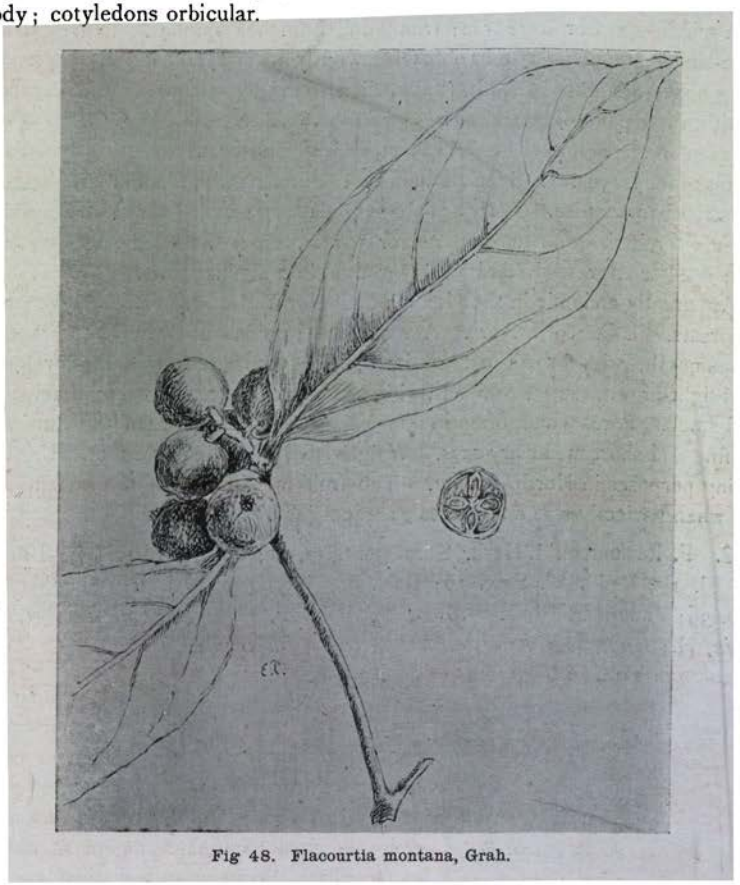


Fig 48. Flacourtia montana, Grah.

An evergreen tree. Leaves and racemes pubescent or tomentose. Fruit globose, size of a cherry ... 1. F. montana.

Deciduous small trees or shrubs. Racemes and leaves quite glabrous. Fruit size of a pea.

Flowers in short racemes or panicles, not on long axillary thorns. Stigmas 5-11, free or connate 2. F. Ramontchi.

Flowers solitary or twin, usually on long axillary thorns. Stigmas 3-4, usually free .... 3. F. sepiaria.

F. montana, Grah. Cat. Bomb. Pl. 10; Fl. Br. I. 1, 192; Dalz. & Gibs. Bomb. Fl. 10; Cooke Fl. Pres. Bomb. 1, 55; Gamble Ind. Timb. 39. *Han sampige, gudda*, K. *Attak, champer, champari,* M.

A middle-sized or large tree; trunk and branches spinous. Leaves ovate, elliptic-lanceolate, acuminate or obtusely abruptly acuminate, coriaceous, crenate, shining above, glabrate beneath, (hairy when young), 3-5-nerved from the base and with a few pairs of lateral nerves; midrib tomentose; blade 5″-7″ by 2″-3″; petioles ·3″ long. Flowers small, in short, densely pubescent racemes, fascicled in the axils of the leaves. ♂: Sepals tomentose. Stamens with filaments ·2″ long. ♀: Sepals rusty tomentose. Ovary urn-shaped, glabrous; styles 5, reflexed, notched at apex. Fruit size of a cherry, red or purple, about 6-seeded; pedicels very short; seeds compressed, hard, woody, rough, in 2 distinct rows.

Apparently endemic in the Konkan and North Kanara, tropical evergreen rain-forests. Fl. C. S. Fr. April. A small tree; spines 2″-3″ long. Bark thin, grey, smooth, with or without lenticels; green parenchyma well developed. Wood light-brown, tough, compact, with a satin-like lustre, and a characteristic foetid smell. Pores small, often in lines of 2-3 together between the numerous very fine and short medullary rays. Weighs 50 lbs. to the cubic foot. Used for building purposes in North Kanara. The fruit is edible with a pleasant acid taste when perfectly ripe and makes excellent jelly.

2. F. Ramontchi, L'Herit. Stirp. 59. t. 30, 31; Fl. Br. I. 1, 193; Brandis For. Fl. 18; Bedd. Fl. Sylv. 16; Dalz. & Gibs. Bomb. Fl. 10; Gamble Ind. Timb. 39; *F. sapida,* Roxb. Fl. I. 3, 835. *Paker, Kakey, bhekal, tambat*, M.; *Kanju,* H.; *Hunmunki, hanumanth, bhably*, K. *Bhorkhakai,* Bhil.

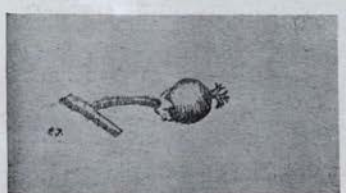


Fig 49. Flacourtia Ramontchi, L'Herit. Var. *sapida.*

A large shrub or small, spinous or unarmed tree. Leaves ovate, obovate or suborbicular, obtuse or acuminate, membranous or coriaceous, serrate or crenate; blade 1·6″-4″ by ·6″-2·5″; petioles ·25″-·5″ long. Flowers small, white in small, branched racemes. Sepals ovate, ciliate. Styles about 5, distinct, connate or O; stigmas 3-11, free or connate. Berry about ·5″ long, dark purple or reddish, pulpy, edible, sweet; seeds 8, warted, rough.

Three varieties of this variable species are found within the limits of the Bombay Presidency.

1 VAR. *sapida.*—A small tree. Spines often branched. Leaves usually small, glabrous, cuneate-obovate. Styles about 5, distinct, reflexed and 2-divided at tips. Common in the North Kanara and Southern Mahratta Country jungles,

ascends to 3700′ in the Khandesh Satpuras, common near the lake at Tooranmal in the Akrani.

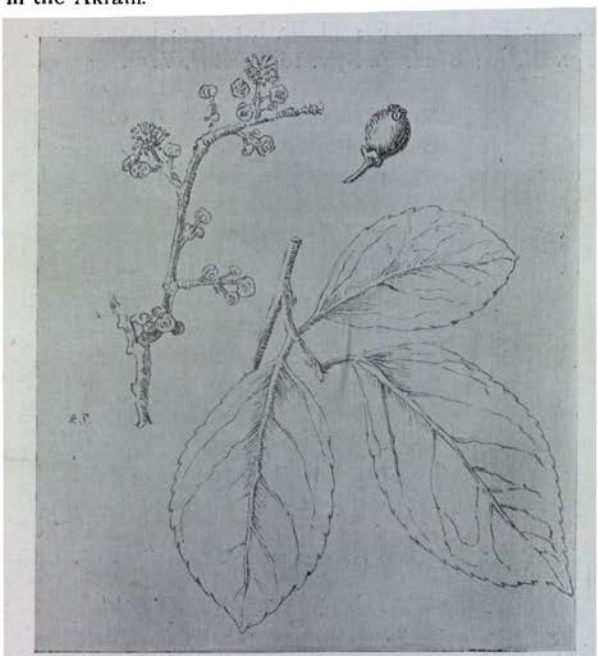


Fig 50. Flacourtia Ramontchi, L'Herit. Var. *latifolia*.

2 VAR. *latifolia* —A small tree. Leaves coriaceous, large, broad, glabrous. Stigmas 3-4, sessile, longitudinally 2-grooved. Common in the ghât jungles from Bombay southwards. Dr. Cooke in his Flora of the Presidency of Bombay makes a separate species of this variety principally on account of its 3-4, sessile, grooved stigmas.

3 VAR. *occidentalis*.—A small tree, more or less covered with grey, velvetty tomentum. Styles as in Var. *sapida*.

The specimens of this variety seen, were marked "from the Deccan hills" but without locality named; rare in this presidency.

Madagascar; throughout India on dry hills and in deciduous, monsoon or thorn-forests, also in the Prome district of Burma; sometimes cultivated. Fl. Nov.-March. Fr. Feb.-Aug. In dry districts like Khandesh, is often bare of leaves during the flowering season. Bark grey scaly, thin. Wood red, hard, close and even-grained, durable, but splits. Weighs 53 lbs. to the cubic foot; used for agricultural implements.

Fig 51. Flacourtia Ramontchi, L'Herit. Var. *occidentalis*.

Fruit and leaves are eaten; fruit either cooked or raw; leaves are cattle-fodder. The gum and powdered bark are employed in native medicine.

3. F. sepiaria, Roxb. Cor. Pl. 1, 48. t. 68; Fl. Br. I. 1, 194; Dalz. & Gibs. Bomb. Fl. 11; Brandis For. Fl. 18; Bedd. Fl. Sylv. 16. *Tambat*, Vern.

A very rigid, spinous shrub; thorns 2"-4" long, stout or slender, bearing flowers and fruit. Leaves small, obovate base cuneate, glabrous, shining above, crenate-serrate in the upper half; blade about 1" by ·5"; petiole ·1" long. Flowers solitary or few in short racemes. Styles 3-4, distinct.

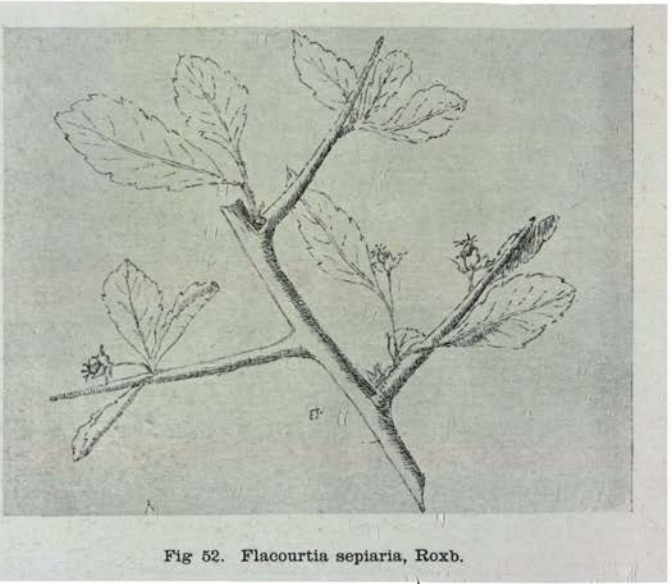


Fig 52. Flacourtia sepiaria, Roxb.

Fruit smooth, reddish, turning dark-coloured when ripe, size of a pea, 4-6-seeded. Seeds angular, very rugose.

Dry jungles throughout Bengal, the W. Peninsula, Upper Burmah, Andamans and dry districts of Ceylon; common in the Deccan towards the ghâts; also on stony ground near the coast of North Kanara, where it is associated in solated thickets with *Canthium parviflorum,* and *Memecylon edule.* Fl. C. S. Fr. R.S.

A thorny shrub with stiff, spreading branches. Bark thin, reddish. Wood light-red, hard and close-grained. A common xerophitic species of small economic importance.

F. Cataphracta, Roxb. in Willd. Sp. Pl. IV. 830; Fl. Br. I. 1, 193; Dalz. & Gibs. Bomb. Fl. 10; Gamble Ind. Timb. 59; Cooke Fl. Pres. Bomb. 1, 55. *Juggum*, Vern. Fruit very acid, size of a small plum. This species, given on the authority of the "Bombay Flora," is said to be found in the Wari country in the Konkan, on the banks of rivers. It does not appear to have been observed by other botanists since Dalzell's time.

5. HYDNOCARPUS, GÆRTN.

Trees. Leaves alternate, entire or serrate; stipules foliaceous, deciduous. Flowers solitary or in small racemes, dicœcious. Sepals 4-5, free, imbricate. Petals 5-9, each with a basal-scale or with the scales cohering in a cup. Male fl.: Staminodes 5 or more. Ovary 1-celled; stigmas 3-6, dilated, lobed; ovules many on 3-6, parietal placentas. Fruit globose with a hard rind, many-seeded; albumen oily; cotyledons very broad, flat.

H. Wightiana, Blume, Rumph. IV, 22; Fl. Br. I. 1, 196; Dalz. & Gibs. Bomb. Fl. 11; Bedd. Fl. Sylv. 16; Cooke Fl. Pres. Bomb. 1, 57; Gamble Ind. Timb. 42. *Kastel, kantel, kiti, kabasale, kawti* M.; *Toratti, surti,* K.; *Kudre sulte,* Vern.

Fig 53. Hydnocarpus Wightiana, Blume.

A large, evergreen tree; young parts brown-pubescent. Leaves ovate or oblong-lanceolate, acuminate, entire or serrate, coriaceous or membranous,

nearly glabrous; lateral nerves about 8 pairs, distinct beneath and with numerous cross veinules; blade 4″-9″ by 1·5″-4″; petioles about ·5″ long; stipules pubescent, linear, deciduous. Flowers solitary or racemed, white, ·5″ across. Sepals unequal, the 3 inner longest. Petals ciliate, twice as long as the ovate, fimbriate basal-scales. Stamens villous at the base; anther-cells distinct. Ovary densely pubescent. Fruit 2″-4″ in diameter, globose, uneven, warted, (the surface of fruits collected in the Konkan are even and not warted), brown tomentose; seeds obtusely angular, imbedded in pulp.

Endemic in the Western Indian peninsula from the Konkan southwards; North Kanara, common in tropical rain-forests. Fl. Feb.-Apl. Fr. R. S.

A large, evergreen tree; stems often fluted. Bark brownish, rather rough, about ·25″ thick. Wood yellowish-grey, hard, close-grained, smooth. Pores few, small, single or divided. Medullary rays numerous, fine, wavy, joined by many transverse, irregular fine wavy lines of white tissue. Annual rings distinct. Weighs 61 lbs. to the cubic foot. Used for building purposes (beams and rafters) in North Kanara. Seeds yield a yellow (*chalmogra*) oil, used for burning and in native medicine for skin diseases, also taken internally.

Order X.—PITTOSPORACEÆ.

Trees or shrubs, erect or climbing. Leaves entire, alternate or subverticellate, exstipulate. Flowers small, hermaphrodite, terminal or axillary. Sepals and petals each 5, imbricate. Torus small Stamens 5, hypogynous, opposite the sepals. Ovary 1-celled, with 2-5, parietal placentas, or 2-5-celled by the projection of the placentas, with many parietal or axile, anatropous ovules; style simple; stigma 2-5-lobed, terminal. Fruit a woody capsule or indehiscent, many-seeded; seeds in pulp; albumen copious; embryo small; radicle next the hilum.

An unimportant order, containing two small arborescent species of the genus *Pittosporum,* indigenous in the Bombay Presidency along the Western Ghâts.

PITTOSPORUM, BANKS.

Erect shrubs or small trees. Leaves quite entire, exstipulate. Sepals free or connate below. Petals connate at the base. Ovary sessile or shortly stalked, incompletely 2-3-celled; ovules 2 or more on each placenta; style short. Capsule 1-celled, woody, usually 2-valved; placenta in the middle of each valve. Seeds smooth, imbedded in viscid pulp.

Glabrous. Flowers small. Fruit pisiform ... 1. P. floribundum.

Tomentose. Flowers larger. Fruit compressed with 2 orbicular, thick valves ... ... 2. P. dasycaulon.

1. P. floribundum, W. & A. Prodr. 154; Fl. Br. I. 1, 199; Dalz. & Gibs. Bomb. Fl. 44; Bedd. Fl. Sylv. 17; Brandis For. Fl. 19; Grah. Cat. Bo. Pl. 38; Cooke Fl. Pres. Bomb. 1, 58; Gamble Ind. Timb. 43; *Celastrus verticellata,* Roxb. Fl. Ind. 1, 624. *Yekkadi, vehkali, vehyenti,* M.

A small tree, often with verticellate branches. Leaves lanceolate or oblong-lanceolate, acute or acuminate, margins waved, coriaceous, glabrous, shining, above, pale beneath; blade 2″-6″ by 1″-3″; petioles about ·5″ long; midrib prominent beneath; lateral nerves usually faint. Flowers small, ·3″ across, yellow, in compact or open, terminal, corymbose panicles; pedicels slender, ·25″ long, bracteolate at the base. Sepals ·1″ long, sub-ciliate, obtuse or acute. Petals ·20″ long, free, linear-oblong, obtuse, at length recurved. Ovary hairy; style simple, glabrous; stigma notched. Capsule pisiform, ·25″ in diameter, glabrous, rough, 6-seeded. Seeds smooth, black, angular.

Himalaya from Sikkim to Garwal, ascending to 7000′ near Darjeeling, Khasia Hills, Burmah and the Western Ghâts from the Konkan to the Nilghiris; usually in dry rocky situations. A small, evergreen tree. Bark grey, rough with small, horizontal, lenticular specks. Wood light-coloured, strong and tough. Bark bitter and aromatic, used as a febrifuge and believed to be an antidote to snake poison. Fl. Apl.-Sept. Fr. C.S.

2. P. dasycaulon, Miquel in Herb. Hohenack, 775; Bedd. Fl. Sylv. 236. Fl. Br. I. 1, 190; Cooke Fl. Pres. Bomb. 1, 58; Gamble Ind. Timb. 43. *Gapsundi*, M. *Boogri*, K.

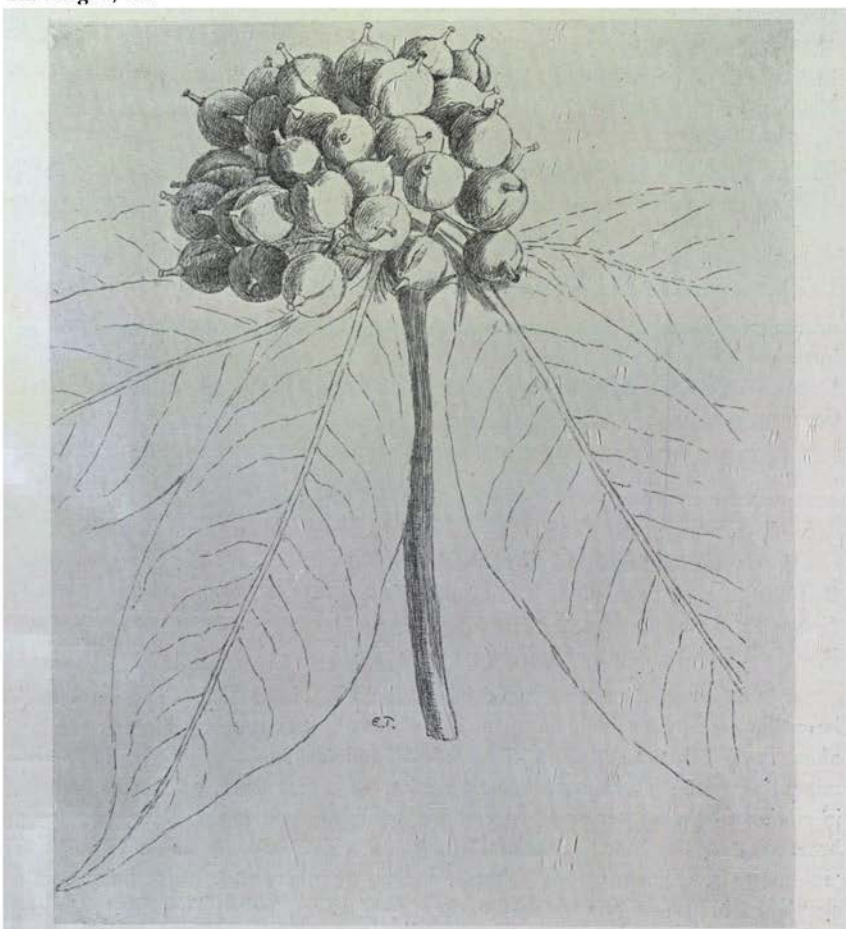


Fig 54. Pittosporum dasycaulon, Miq.

A small tree; branchlets, young petioles, buds etc. densely rusty-tomentose. Leaves thin, coriaceous, lanceolate or broadly ovate, acute, glabrous, or midrib downy beneath, shining above, paler beneath; blade 2″-5″ by ·75-2·5″; petioles ·5″ long, channelled above, tomentose when young. Flowers white, ·4″ across, in short, dense, tomentose corymbs; pedicels rufous-hairy, slender, bracteolate, ·20″ long. Sepals ·1″ long, ovate, acute, ciliate. Petals yellow, ·3″ long, narrow-oblong, imbricate and nearly glabrous. Anthers bright yellow. Ovary densely tomentose; style linear; stigma capitate. Capsule ·5″ across, 2-valved; compressed, crowned with the persistent style, densely grey tomentose when young; valves woody, glabrous, channelled down the middle, white inside. Seeds 4-6, black, smooth, irregularly obtusely angled, compressed.

Western Peninsula, Konkan, North Kanara, Belgaum; common in the evergreen ghât jungles.

This small evergreen tree appears to have a rather restricted habitat, and to be endemic in the southern ghât forests of Bombay. It is not mentioned by Dalzell from the northern parts of the presidency, nor by Beddome from Madras and replaces *P. floribundum*, in the moist rain-forest region of Kanara and Belgaum where it is fairly abundant locally. Fl. cold season. Fr. Feb. to rainy season.

Order XI—TAMARICACEÆ.

Shrubs, bushes or small trees. Leaves alternate, usually fleshy, scale-like, imbricating. Flowers terminal or axillary, racemose or paniculate, regular, usually bisexual. Sepals 5, imbricate, free or connate at the base. Petals 5, free or united in a tube, imbricate. Stamens 5-10 or many, free or connate, inserted on an annular, lobed disk, with 10 glands; anthers versatile, apiculate. Ovary syncarpous; styles 2-5, free or connate or stigmas 3-5, sessile; ovules numerous. Capsule dehiscent, with as many valves as styles. Seeds crested, winged or covered with down; albumen O, or small; embryo straight.

TAMARIX, LINN.

Bushes or small trees. Leaves minute, sheathing or amplexicaul. Flowers small, white or red, spikate or racemose-panicled. Sepals and petals free; petals inserted beneath a glandular-crenate, lobed disk, free or slightly connate at the base. Stamens 5-10, free or connected at the base only, inserted on the disk. Disk hypogynous. Ovary 1-celled; styles 3-4, short, thick; ovules at bottom of the ovary. Seeds smooth, with a long coma; albumen O.

Stamens 5:

Flowers bisexual, in large racemose panicles ... 1. T. gallica.
Flowers monoicous, in short, close, cylindrical spikes ... ... 2. T. dioica.
Flowers bisexual, in long, interrupted spikes ... 3. T. articulata.

Stamens 10:

Leaves not punctate, sheathing amplexicaul ... 4. T. ericoides.
Leaves punctate, closely sheathing ... ... 5. T. stricta.

1. T. gallica, Linn. Fl. Br. I. 1, 248; Var. *indica;* Brandis For. Fl. 20; Bedd. Fl. Sylv. 20; Cooke Fl. Pres. Bomb. 1, 70; Gamble Ind. Timb. 46. *Lei, lai, jhaw*, Sind; *The Tamarisk.*

A bush or small, green-branched tree. Leaves not sheathing, glaucous, white margined, smooth, scale like, acute; apex patent or loosely adpressed; base semi-amplexicaul. Flowers white, usually bisexual, ·12″ in diameter, in slender, panicled racemes; bracts very acute, membranous, immediately beneath and shorter than the flowers. Sepals 5, ½ as long as the petals; margins denticulate. Petals oblong, notched at the apex, pink. Stamens con-

fluent with the disk glands. Ovary sub-trigonous; styles 3, articulated to the ovary; usually short and slightly connate. Capsule ·1″ long, attenuated from an ovoid base, twice as long or more than the withered sepals at the base.

Throughout India, from the Punjab and Sind to Burmah and southwards to Ceylon; it also is found along the west and south shores of Europe; Africa, Siberia, China and Japan. In India mostly occurs along the banks of rivers and near the sea coast, where it grows gregariously, often associated with *Salvadora*, on salt-impregnated soil. I have neither found it in North Kanara nor in Belgaum.

A small crooked tree, 6′-12′ high and 1′ in diameter with pendulous branches. Bark rough, greenish-brown. Wood open, coarse-grained, useful for fuel. The astringent-galls are used as a mordant in dying; also for tanning and in medicine. The wood is in great demand as fuel for steamers on the river Indus; it is also converted into agricultural implements in Sind. Fl. July-Aug. Fruit ripe Dec.-Feb.

2. T. dioica, Roxb. Hort. Beng. 22; Fl. Br. I. 1, 249; Brandis For. Fl. 21; Bedd. Fl. Sylv. 20; Cooke Fl. Pres. Bomb. 1, 71; Gamble Ind. Timb. 46. *Gaz*, *lao*, *jau*, Sind.

A shrub. Leaves minute, adpressed, sheathing; sheath tubular, apex acuminate, green with a broad white margin. Flowers dioecious, purple or

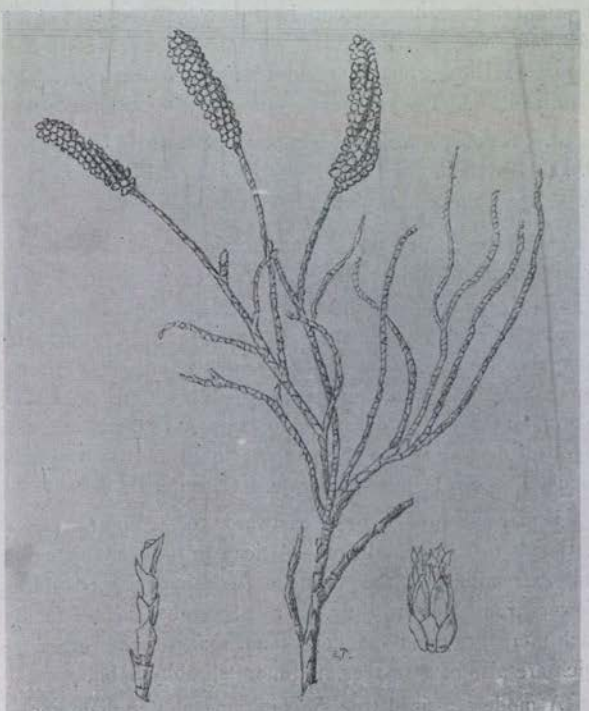


Fig 55. Tamarix dioica, Roxb.

light rose-coloured, spirally arranged in short dense, drooping, peduncled spikes 1″-2″ long; bracts lanceolate with membranous margins longer or shorter than the flowers. Sepals half as long as the petals with a strong midrib. Petals elliptic-oblong, pink. Male fl. Sepals and petals orbicular, nearly equal in bud. Stamens inserted on the notches of the 5-lobed disk. Fem. fl. Stamens abortive. Styles 3, as long as the triquetrous ovary. Capsule oblong, tapering, ·2″ long, surrounded by the withered perianth.

From Sind to Assam, Western Peninsula and Burmah. In the beds of rivers and near the sea-coast; abundant on the Hoogly in Bengal; forms extensive forests along the Indus, associated with *T. gallica*, Fl. May-July. Fr. C.S.

The new alluvium along the Indus river banks is covered in early spring with a dense growth of *Tamarisk* seedlings mixed with *Populus euphratica*, and *Babul*. *T. dioica*, being more abundant in these forests than *T. gallica*. A moderate-sized, gregarious shrub, usually much smaller and greyer in colour than *T. gallica*. Bark dark-coloured, cracked; inner bark red. Wood moderately hard, red; outer portion white. An important source of fuel. The branches and twigs are made into baskets and brooms and are also used for the construction of native huts. The galls are employed in tanning and dyeing.

3. T. articulata, Vahl. Symb. 2, 48, t. 32; Fl. Br. I. 1, 249; Brandis For. Fl. 22; Bedd. Fl. Sylv. 20; Cooke Fl. Pres. Bomb. 1, 71; Gamble Ind. Timb. 46. *Asreli*, Sind.; *Laljhau*, H.

A shrub or small tree. Leaves minute, sheating; sheath obliquely truncate, white margined, with a triangular tooth in place of the lamina, covered with impressed, punctate glands, often hoary with saline efflorescence. Flowers bisexual, sometimes pedicelled ·12″ long, in slender, interrupted spikes; bracts triangular from sheating base, acute, often much shorter than the flowers. Sepals 5, elliptic, ½ as long as the petals, entire or minutely toothed. Petals oblong, conniving at top. Stamens inserted in the alternate notches of the 10-lobed disk. Styles 3, half as long as the trigonous ovary. Anthers apiculate, 2-lobed; lobes separate. Capsule trigonous, oblong, tapering.

Upper and Middle Sind, eastwards to the Jumna, often cultivated; extends westwards to Egypt and South Africa; grows well on saline soils. The leaves and extremities of the branches are partly shed during the cold season. Flowers from May to July. Fr. September. The foliage of this species is much more grey and glaucous than that of the other species of *Tamarisk*, which are also of a smaller, and more shrubby habit.

A moderate-sized tree, 60′ high and 2′-4′ in diameter; trunk erect, tapering rapidly upwards with a close, oval head; the slender branchlets are hoary with

impressed, punctate glands. Bark grey, rough, longitudinally furrowed; furrows crossed by transverse, short and shallow cracks. Sapwood distinct. Wood white, pinkish, moderately hard, open and coarse-grained, fairly tough. Weighs 61 lbs. to the cubic foot. Used for agricultural implements, framework of native beds, etc. It is converted into charcoal and when dry and seasoned is also a valuable firewood.

The bark and irregularly rounded galls *(Sakun*, Sind.*)* are used in tanning. *Tamarisk manna (misri lei*) produced on the twigs by the puncture of an insect is collected in the hot weather and used to adulterate sugar, also medicinally. *Manna* is also produced on the two other species, *T. gallica*, and *T. dioica*, in Sind.

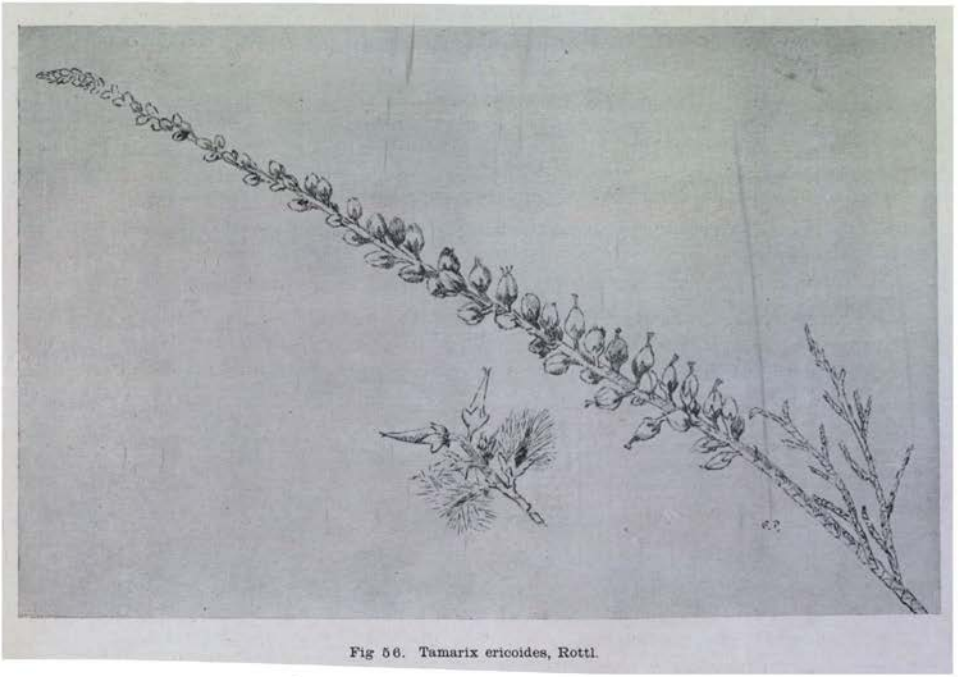


Fig 56. Tamarix ericoides, Rottl.

4. T. ericoides, Rottl. in Nov. Act. Nat. Cur. Berol. IV, 214, t. 4; Fl. Br. I. 1, 249; *Trichaurus ericoides*, W. & A.; Dalz. & Gibs. Bomb. Fl. 14. *Jao, saruh, sarata, serni, godi serni,* M.

A large shrub. Leaves sheathing, amplexicaul, minute, scale-like, acuminate. Flowers bisexual, heath-like, ·25″ across, rose-pink, in terminal or axillary, rather stout racemes about 8″ long. Sepals 5, imbricating. Petals slightly unequal. Stamens 10; filaments distinct. Disk cup-shaped, 10-toothed. Sepals 3. Capsule ·5″ long, slender, beaked. Seeds rostrate, with a long coma at the tip. Very distinct and with much larger flowers and fruit than in the other species of *Tamarix*.

Bengal, Central and Western India and Ceylon. Common in the beds of the Konkan and Deccan rivers; in the Kalanaddi of North Kanara near Sulgeri. Flowers during the cold weather, Nov. to Jan., Fr. Feb.

A gregarious, low, bushy, local shrub. Bark dark-coloured, smooth, vertically cracked. Wood reddish-white, moderately hard. The most common peninsular species of *Tamarisk*. In the Ahmednagar and Poona districts the twigs are used for making brooms and bushes.

Wight & Arnott in the Prodr. Fl. Penin. Ind. Or. 40, keep this species distinct from *Tamarix*, under the generic name *Trichaurus*, and make the following remarks with which I am disposed to agree. ["This genus (viz. *Trichaurus*,) is mostly allied to *Myricaria*, but differs from it by the distinct styles and stigmas and by the torus being only expanded into a tooth, instead of a connecting membrane, between the stamens. From *Tamarix*, the beaked seeds and other characters will readily distinguish it."] Sir W. Thiselton Dyer in the Fl. Br. I. 1, 249, restored to this species Rottler's name of *Tamarix ericoides*.

5. T. stricta, Boiss. Fl. Or. I. 778; Fl. Br. I. 1, 249. Habit of *T. articulata*, Vahl., from which, according to Boissier, it is distinguished by the thicker branchlets, more remote leaves, sub-sessile stigmas, and the different number of stamens. A very rare plant found in Sind and Beluchistan, Fl. Br. I.

Order XII.—GUTTIFERÆ.

Trees or shrubs, abounding in greenish or yellow, resinous juice. Leaves simple, opposite, often coriaceous, rarely whorled or stipulate. Flower axillary or terminal, solitary or clustered, in racemes or panicles, white, yellow or red, regular, uni-sexual, polygamous or hermaphrodite. Sepals 2-6, imbricate or in decussate pairs. Petals 2-6, rarely more, usually much imbricated and contorted. Male fl.: Stamens usually indefinite, hypogynous; filaments free, or variously connate, or in as many phalanges as there are petals; anthers various. Fem. fl.: Staminodes various. Ovary 1-2 or more celled; ovules 1 or more in each cell; stigmas as many as ovary-cells or variously consolidated, sessile or on a longer or shorter style. Fruit an indehiscent berry or drupe with a fleshy or pulpy mesocarp or a capsule opening in as many valves as cells. Seeds large; albumen O; embryo consisting of a large radicle (tigellus) with small or obsolete cotyledons, or of thick, free or consolidated cotyledons with a very short, inferior radicle.

Stigma sessile.

Embryo a solid tigellus with the cotyledons minute or O.

Calyx of 4 decussate or 5 sepals .... 1. Garcinia.

Calyx closed in bud, in flower bursting into 2 valves.... .... 2. Ochrocarpus.

Stigma on a slender style; embryo of 2 fleshy cotyledons with a small radicle.

Ovary 1-celled, 1-ovuled. Fruit indehiscent ... 3. Calophyllum.

Ovary 2 celled, 4-ovuled. Fruit dehiscent .... 4. Mesua.

1. GARCINIA, LINN.

Evergreen trees, usually with much yellow juice. Leaves coriaceous, rarely stipulate. Flowers axillary or terminal, solitary or fascicled, rarely paniculate. Sepals 4 and decussate or rarely 5-6, imbricate, Petals 4-5, imbricate. Male fl.: Stamens indefinite, free or united in an entire or lobed, fleshy mass or tetradelphous, surrounding a rudimentary style; anthers sessile or on short, thick filaments, 2, rarely 4-celled, erect or peltate, dehiscing by slits or pores or circumciss. Female or hermaphrodite fl.: Staminodes various, free or united. Disk thick, lobed and plaited or O. Ovary 2, many-celled; stigma sessile, lobed,

smooth or tubercled; ovules solitary in each cell, attached to the inner angle of the cell. Fruit a berry; embryo an undivided, thick homogeneous mass or radicle (tigellus), the cells of which are filled with oil.

Sepals and petals 4 each.

Fruit globose, 4-8-celled, smooth, pulpy .... 1. G. indica.

Fruit ovoid, somewhat curved, and with 6-8, longitudinal grooves .... 2. G. Cambogia.

Fruit globose, 4 celled, not pulpy .... 3. G. Morella.

Sepals and petals 5 each.

Ovary not seated on a thick, plaited disk; stigmatic lobes 5-6.

Leaves large, up to 20″ long. Fruit large, 2″ in diameter, yellow .... 4. G. Xanthochymus.

Leaves medium-sized, up to 5″ long. Fruit 1″ in diameter, green ... . 5. G. ovalifolia.

Ovary seated on a plaited and lobed disk; stigmatic lobes 3 .... 6. G. malabarica.

1. G. indica, Chois. in DC. Prodr. 1, 561; Fl. Br. I. 1, 261; Cooke Fl. Pres. Bomb. 1, 76; Gamble Ind. Timb. 54; *G. purpurea*, Roxb. Dalz. & Gibs. Bomb. Fl. 31; Bedd. Fl. Sylv. 21; Grah. Cat. Bo. Pl. 25. *Murgal,* K. *Bhirand, ratamba,* M.; *Kokam,* H. '*Wild mangosteen*' of the English and '*Brindon*' of the Portuguese.

A tall, slender tree with drooping branches. Leaves ovate, obovate, or oblong-lanceolate, acute or acuminate, glabrous, dark-green above, pale beneath, red when young, thin when dry; blade 2·5″-4″ by 1″-1·5″; petioles ·25″-·5″ long. Male flowers stout pedicelled, terminal and axillary, 2-8-fascicled; pedicels ·25″ long. Sepals decussate, ·25″ long, ovate, orbicular; outer smaller. Petals 4, thick, longer than the sepals. Stamens 10-20, forming a short, capitate column; anthers oblong, dehiscing longitudinally. Female flower usually solitary, terminal and axillary, shortly and stoutly peduncled, Staminodes in 4 masses, each of 2-7, in one or more rows. Ovary 4-8-celled; stigma sessile, 4-8-lobed. Fruit globose, size of a small orange, 1″-1·5″ in diameter, deep purple, acid, fleshy; seeds 5-8, large.

Apparently endemic in the Western ghât moist tropical rain-forests; common in many of the North Kanara and South Konkan evergreens; often planted. Fl. Dec.-Feb. Fr. ripe Apr.-May. A tall, graceful tree, seldom more

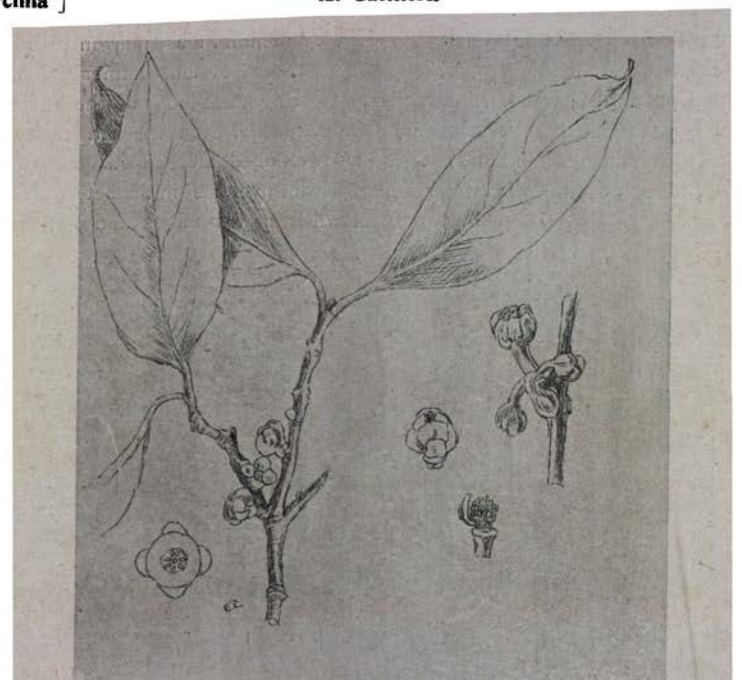


Fig 57. Garcinia indica, Chois.

than 1′ in diameter, usually buttressed at the base. Bark very thin, dark shiny and almost tesselated by shallow fissures. Wood light-brown or yellowish, with irregular patches of darker tissue, moderately hard. Pores more numerous and larger than in that of *G. Cambogia*, and it is also a lighter wood. Weighs 48 lbs. to the cub. ft.

The fruit is edible when perfectly ripe. The seeds yield the well known concrete oil or butter *(Kokam)* in which a considerable trade is carried on by the Goanese along the Western Coast.

2. G. Cambogia, Desr. in Lamk. Encycl. III, 701; Fl. Br. I. 1. 261; Bedd. Fl. Sylv. t. 85; Gamble Ind. Timb. 54. *Oopagi mara, dharambe*, K.

A small or medium-sized glabrous tree, with horizontal or drooping branches. Leaves broad, elliptic, obovate, acute or obtuse, thinly coriaceous, dark-green above, paler beneath; midrib strong beneath; lateral nerves numerous, parallel, very oblique, more or less distinct; blade 3″-5″ by ·75″-3″; petiole ·5″-75″ long. Male flowers ·5″ in diameter, pedicelled, in 4-20-flowered, axillary or terminal fascicles; pedicels ·25″ long, thickened at the ends and some-

times reflexed. Sepals ·2″ thick, fleshy, with membranous margins. Petals thick, red, fleshy, twice the yellowish-green sepals. Stamens numerous, about 20; filaments united; free portion very short. Stigmatic-lobes of the rudimentary ovary yellow, short, 3 or O. Female flower larger than the male, solitary, terminal. Staminodes in 4 masses. Ovary 4-8-lobed and celled. Stigmatic-rays 4-8, tubercled, free, yellow, spreading. Fruit ovoid, 2″ in diameter, canary-yellow or red, 6-8-grooved; furrows broad with angular edges and flat-topped ridges; seeds 6-8, arillate.

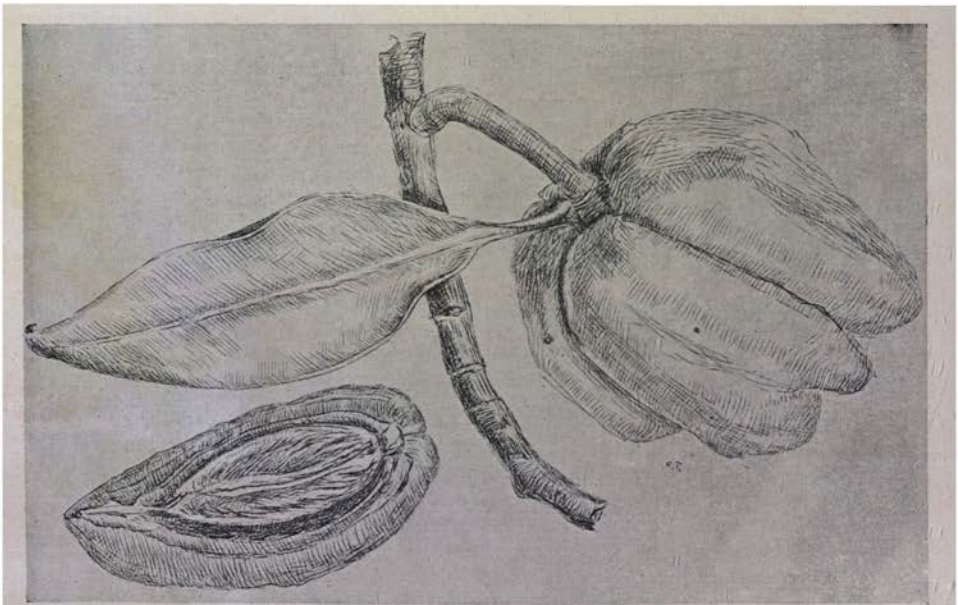


Fig 58. Garcinia Cambogia, Desr.

Western Peninsula from the Konkan to Travancore and Ceylon, ascending to 6000′ on the Nilghiris. On the southern ghâts of North Kanara, in evergreen rain-forests. Fl. C. and H. season. Fr. ripe R. S. Bark ·25″ thick, grey, smooth, lenticellate, containing abundance of bright-yellow gamboge. Wood grey, close-grained, shining, hard. Pores small and very small, in short, radial lines, between the numerous fine, medullary rays. Weighs 54lbs. to the cub. ft. The bark contains much yellow gum, insoluble in water, but

soluble in spirits of turpentine with which it forms a beautiful yellow varnish. Fruit edible. The name *"Dharambe,"* used at the present day by the natives in the village near the rocks of Yena, North Kanara, for this tree, is very like *Dharambo,* given by van Rheede in the Hortus Malabaricus more than 200 years ago, he states it flowers and fruits twice in the year. *Dharambe* is also a Konkani name for *G. Xanthochymus.*

3. G. Morella, Desr. in Lamk. Encycl. III, 701; Fl. Br. I. 1, 264; Bedd. Fl. Sylv. t. 86. Gamble Ind. Timb. 55. *G. pictoria,* Roxb. Bedd. Fl. Sylv. t. 87. *Arsina gurgi, hardala,* K. *The Gamboge Tree.*

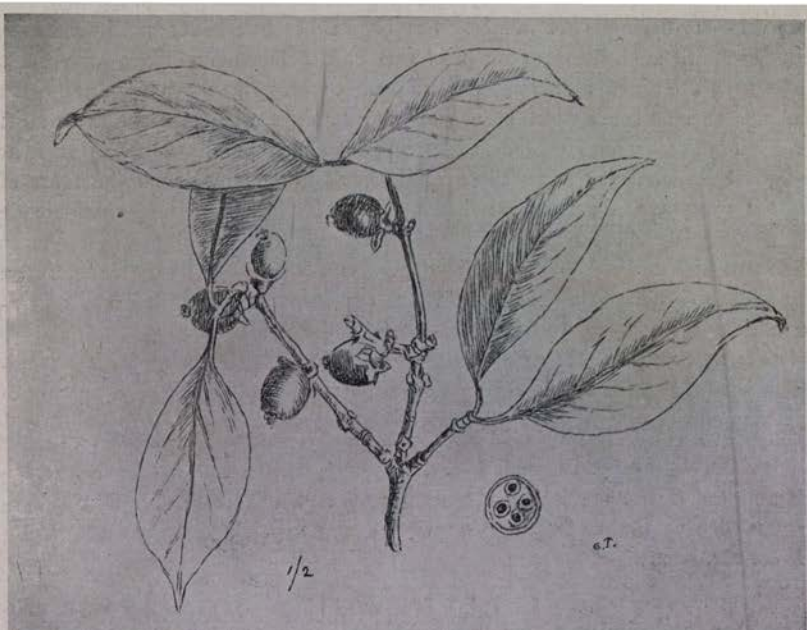


Fig 59. Garcinia Morella, Desrouss.

A moderate-sized, quite glabrous, evergreen tree; branchlets quadrangular. Leaves coriaceous, elliptic-obovate, obtusely acuminate; base acute; midrib strong beneath; veins oblique, not so close together as in *G. Cambogia;* blade 3″-6″ by 1·5″-3″; petioles ·25″ long, stout. Male flowers 1-3, axillary, sessile or subsessile. Sepals 4, decussate, orbicular, concave; outer smaller. Petals somewhat exceeding the sepals. Stamens on a raised receptacle; anthers numerous, peltate, flattened; dehiscence circumciss. Female flower solitary, axillary, larger

than the male. Ovary subsessile ; stigma sessile, irregularly 4-lobed, lobes dentate and tubercled ; staminodes about 12, connate at the base. Fruit size of a small plum, globose, 4-seeded, containing much yellow gamboge.

Forests of Eastern Bengal, Khasia mountains, W. and E. Peninsulas, Ceylon and eastwards to Siam. In the Siddapur taluka evergreen rain-forests of North Kanara. Fl. Nov. Fr. ripe Feb.-Mar. Bark generally smooth, exfoliating in grey, shining patches or scales ; inner bark yellowish-white with numerous gamboge yielding glands. Wood yellow, hard, mottled. Weighs 56 lbs. to the cub. ft. This moderate-sized tree produces the true gamboge of commerce, which is procured principally from Siam and is used in Europe as a pigment and in Burma for dyeing silken fabrics. Gamboge is obtained in Madras by pricking the bark with an instrument made of wire nails and shaped like a hair brush. The nails are fixed at about ¼ of an inch apart. After pricking, the gum collects in small beads which solidify after 3 or 4 days, when they are collected. The cost of collection is stated to be 1 rupee 8 annas per lb. In Ceylon near Kandy I observed that small slices of the bark are removed and the tears of gamboge are formed and collected when dry. Mr. Gamble is of opinion vide " Indian Timbers " that the question of forming plantations of gamboge trees in Kanara and Malabar is worth considering. As this species is very common on many of the ghâts of N. Kanara particularly so in Siddapore and Sircy, experimental collections of the gum should first be undertaken to ascertain the market value of the material. The rind of the fruit may be used as a tan. The semi-solid, yellow, fatty oil obtained from the seeds is used in Mysore as a substitute for lamp-oil, also in cookery. Gamboge is used in medicine.

4. G. Xanthochymus, H. f. Fl. Br. I. 1, 269 ; Cooke Fl. Pres. Bomb. 1, 78 ; Gamble Ind. Timb. 50 ; *Xanthochymus pictorius,* Roxb. Bedd. Fl. Sylv. t. 88 ; Dalz. and Gibs. Bomb. Fl. 31. *Janagi, javangi, davangi, gansargi, deavkai,* K ; *Dharambe,* Kon.

A moderate-sized, glabrous, evergreen tree ; branchlets green angular (sometimes sharply), grooved, drooping. Leaves large, coriaceous, lanceolate or linear-oblong, acute or acuminate, glabrous, shining above and below ; midrib very prominent beneath ; lateral nerves about 25 pairs, irregularly parallel and distinctly anastomosing within the margin ; blade 8″-20″ by 2″-4″ ; petioles stout, angled, ·5″-1″ long, rugose with innumerable raised parallel lines, dilated at insertion on the branchlets. Male flowers ·5″ in diameter, 4-12-fascicled, nearly sessile, on short, stout, axillary peduncles. Stamens in 5 bundles, alternating with 5 fleshy glands. Hermaphrodite flower : Stamens of male. Ovary pointed, with 5-6 broad, spreading, stigmatic lobes, 5-6-celled. Fruit large, golden-yellow, 2″ in diameter, globose, crowned with the persistent, 5-lobed stigma

which is often lateral and not at the apex; seeds 1-4, immersed in pulp. When green the fruit is filled with a kind of gamboge, when ripe there is apparently no gamboge but a yellowish pulp instead. The large seeds are covered with a brown, veined testa and the embryonic mass is filled with a white, sticky juice.

Fig 60. Garcinia Xanthochymus, Hook. f.

Eastern Himalaya, E. Bengal, Burma, Assam, E. Peninsula, W. Peninsula on the ghâts, from Bombay southwards. Abundant in the evergreen rain-forests of N. Kanara. Fl. Apl.-May. Fr. C. & H. seasons.

A moderate-sized tree. Bark brown, lenticellate; inner bark, white, ·25″ thick, without yellow glands. Wood light, yellowish-brown, hard, strong, moderately heavy. Medullary rays fine, widely apart or close together; transverse bars very numerous. Weighs 45 lbs. to the cub. ft. Fruit yellow, very acid, edible. As ornamental tree with beautiful dark green, dense foliage; sometimes cultivated in gardens. The gamboge from this tree is resinous and comparatively worthless as a pigment. The bark is used as a dye in Assam.

5. G. spicata, Hook. f. Trimen Fl. of Ceylon 1, 98; Gamble Ind. Timb. 50; *G. ovalifolia*, Hook. f. Fl. Br. I. 1, 269; *Xanthochymus ovalifolius,* Roxb. Bedd. Fl. Sylv. 21; Dalz. and Gibs. Bomb. Fl. 31. *Haldi,* M. *Tavir,* Vern.

A small or medium-sized evergreen tree; branchlets angular. Leaves ovate, elliptic-oblong or lanceolate, obtuse or acute, coriaceous, shining; blade 3·25″-8·5″ by 1·75″-3·5″, conspicuously veined when dry; veins anastomosing

within the margin; the opposite petioles ·25″-·5″ long are very thick and expanded into thick, stem clasping ligules at their bases. Flowers ·2″-·3″ in diameter, pedicelled; pedicels articulate, ·25″ long; male and female flowers often mixed in the same fascicle, but usually the females are fascicled and the males spiked, the spikes being as long as 4″. Male flower: Sepals 5, very unequal, coriaceous, orbicular, half as large as the concave, conform, veined, membranous petals. Stamens in 5, broad, fleshy, clawed, spathulate phalanges; anthers 6-10, didymous. Female flowers usually on somewhat longer pedicels than the males. Staminodes small, in 5, trifid phalanges, with effete anthers. Ovary globose, 3-4-celled; style very short; stigma 5-lobed to the middle. Fruit globose, ·75″ in diameter, smooth, deep-green, 1-3-seeded, full of yellow juice.

Western Peninsula, from the Konkan southwards along the Sayadris in evergreen monsoon and rain-forests, also in Ceylon in the dry region, common about Jaffna. Evergreen rain-forests of North Kanara and Konkan ghâts, common near Bhimashunkar in the Poona district. Fl. H. S. Fr. C. S.

A tall tree, 70′ high with a straight trunk; branches smooth, angular, shining, channelled. Bark grey, thick, rough, scaly; inner bark yellow. Wood yellowish-white, smooth, hard, heavy, close silvery-grained with numerous concentric, white, branched wavy bands of tissue forming a network in which aresitu ated the scattered medium-sized pores. Medullary rays, fine, close, numerous. Weighs 59 lbs. to the cub. ft. Wood liable to split and crack.

6. G. malabarica, Talb., Jour. Bomb. Nat. Hist. Soc. XI, 234, t. 1; Gamble Ind. Timb. 50; *G. ovalifolius*, Hook., f. var. *macrantha*, Fl. Br. I. 1, 269; *G. spicata*, Kz. MSS. in Herb. Cal.

A small or medium-sized tree with sulcate, angular branchlets dilated at the insertion of the leaves and inflorescences. Leaves opposite, coriaceous, ovate or oblong, lanceolate, acute or obtuse, glabrous, shining above and beneath; nerves numerous, anastomosing, distinct; midrib prominent beneath; blade 6″-3″ by 2·5″-1″; petioles ·5″-·75″ long, rugose, dilated above the base, so that the two opposite ligular processes clasp the branchlets. Flowers dicœcious. Male flowers white, ·5″-·75″ across, numerous, sessile or shortly pedicelled, fascicled on short, axillary, thick peduncles; pedicels bracteolate at the base. Sepals 4-5, orbicular, ½ the orbicular, white, concave petals. Staminal phalanges 5, thick, equalling the petals, surrounded at the base by and springing from a lobed and plaited, thick fleshy disk; anthers 12, on each phalange, didymous; free part of filament short, stout. Female fl. 1-6, axillary, fascicled Sepals and petals of male. Staminodes in 5, thin, flattened phalanges surrounding the ovary and springing from the edge of a disk similar to that of the male

flowers; effete anthers 4-5, on each phalange, flat, didymous and on longer free filaments than those of the male flower. Ovary 3-celled, crowned with the thick, 3-lobed, spreading stigma.

On the Western Ghâts from North Kanara southwards, common on the Gairsoppah Ghât in evergreen rain-forests. Fl. C. S. Fr. (not seen) R. S.

2. OCHROCARPUS, Thouars.

Evergreen trees. Leaves simple, opposite or 3-verticellate, coriaceous. Flowers axillary, in short cymes or fascicles, polygamous. Calyx closed before flowering, at length opening into 2, rarely 3 valves. Petals 4-7 or more. Stamens indefinite; filaments free or connate at the base. Ovary 2-celled; cells 2-ovuled; style short; stigma broad, peltate. Fruit a 1-4-seeded berry. Seeds large, enclosed in pulp; cotyledons minute, reduced to a small mamilla or O; radicle large and fleshy.

O. longifolius, Benth. and H. f. Gen. Plant. 1, 980; Bedd. Fl. Sylv. t. 89; Fl. Br. I. 1, 270. *Calysaccion longifolium,* Wgt. Ic. t. 1999; Dalz. and Gibs. Bomb. Fl. 32. *Wundy, punay, surungi, suragi, phatapale,* K; *gardundy,* Vern.

A large, quite glabrous, evergreen tree; branchlets terete or angled. Leaves broadly ovate, bluntly acuminate, coriaceous; midrib strong beneath; venation inconspicuous in green leaves but finely reticulate and characteristic when they are dry; blade 6″-8″ by 2″-3″; petioles stout, ·25″ long. Flowers ·5″ across, globose in bud, axillary, pedicelled, in many-flowered fascicles; pedicels ·5″-·75″ long, slender, usually on tubercules, fascicled on the old wood. Calyx-lobes reddish. Petals 4, white, thin, deciduous. Stamens many, yellow; style short, stout; stigma discoid. Fruit 1″ long, obliquely ovoid, tipped by the hard pointed style, stipitate, 1-seeded.

Indigenous and probably endemic on the Konkan and Kanara Ghâts, ascending to 2000′ in evergreen rain-forests, sometimes cultivated. There is a grove of "*Surungi*" trees near Kumpta on the coast of N. Kanara on low-level laterite, probably the remains of an evergreen forest. Fl. Feb.-March. Fr. R. S.

Trees with a cylindrical trunk, 40′-60′ high and 6′ in circumference, are met with in N. Kanara. Bark scaly; scales thick, often covered with small round black patches of lenticular-like markings; inner bark thick, red, with numerous small, yellow, gamboge glands.

Wood moderately-hard, reddish-grey, close-grained, smooth. Pores moderate-sized, equally distributed. Medullary rays numerous, fine. Weighs about 60 lbs. to the cubic foot. Annual rings distinct. Lines of soft tissue numerous but indistinct. The dried flower buds *(Tambra Nagkesar)* are used for dyeing silk and are also used medicinally.

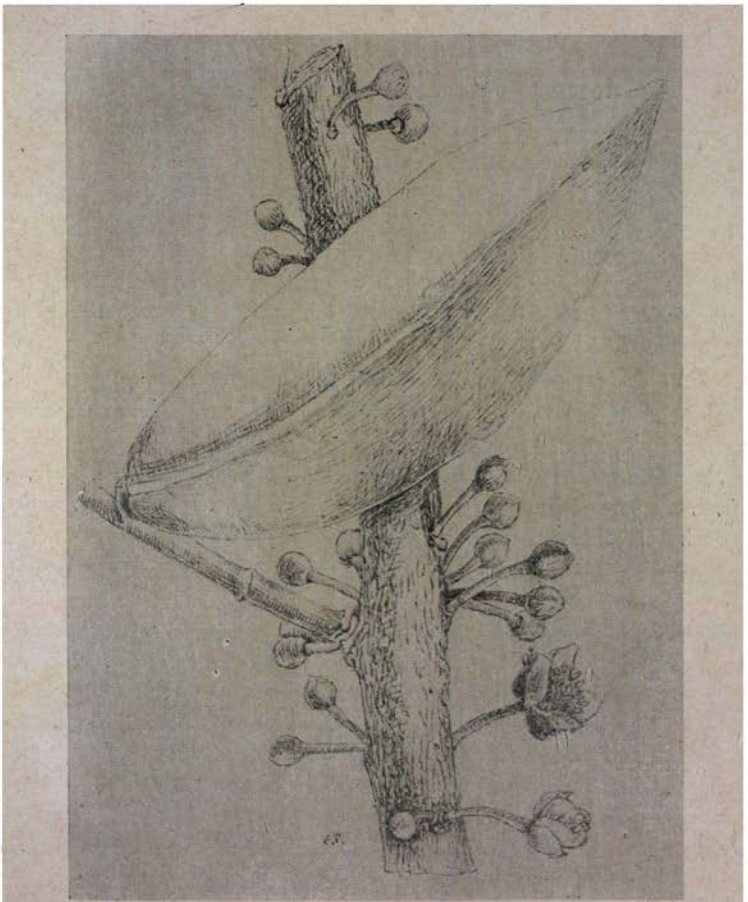


Fig 61. Ochrocarpus longifolius, Benth.

3. CALOPHYLLUM, Linn.

Evergreen trees. Leaves opposite, shining, coriaceous, with numerous close-set, parallel veins at right angles to the midrib. Flowers polygamous, in axillary or terminal panicles. Sepals and petals 4-12, imbricate in 2-3 series. Stamens numerous; filaments filiform, free or connate below; anthers erect, 2-celled. Ovary 1-celled; style slender; stigma peltate; ovule solitary, erect. Fruit an indehiscent, crustaceous drupe; seed erect, enclosed in thin, thick or spongy "floating" tissue.

Petals 4.

A medium-sized, dark scaly-barked, quite glabrous tree. Leaves broad, elliptic. Fruit 1″ in diameter, globose ... ... 1 C. inophyllum.

A very large tree; young parts rusty tomentose. Bark yellowish, deeply fissured. Leaves narrow elliptic. Fruit 1″ long... ... ... 2 C. tomentosum.

Petals 3-O.

A moderate-sized or large tree with characteristic yellow bark. Leaves obovate. Fruit ovoid, small, ·25″ long ... ... 3. C. Wightianum.

1. C. inophyllum. Linn. Fl. Br. I. 1, 273; Bedd. Fl. Sylv. 22; Dalz. and Gibs. Bomb. Fl 31; Cooke Fl. Pres. Bomb. 1, 80; Gamble Ind. Timb. 57; Grah. Cat. Bo. Pl. 26. *The Alexandrian Laurel; Undi, surangi,* M; *Vuma, hona,* K; *Udi*, Cutch.

A glabrous, middle-sized tree. Leaves coriaceous, broadly elliptic, obtuse, shining on both surfaces; blade 5″ by 3″; midrib strong and prominent beneath; petioles ·5″ long. Flowers pedicelled, fragrant, ·5″ across, in lax, few-flowered, axillary racemes, shorter than the leaves; pedicels slender, 1″-2″ long. Sepals 4, outer 2 orbicular, ciliolate, smaller than the inner 2 which are petaloid. Petals 4, white, like the 2 inner sepals. Stamens numerous, yellow; filaments irregularly united in 4 bundles. Ovary purple on a short gynophore; style exceeding the stamens; stigma peltate. Fruit globose, 1″ in diameter, size of a large cherry, smooth.

Indigenous throughout the W. Peninsula, Orissa, Ceylon, Burma and the Andamans, particularly near the sea-coast; also cultivated as an ornamental tree and for its valuable fruit. In the N. Kanara District it is common on the sandy coast laterite soil just above high water mark, often associated with *Anacardium occidentale*, (*Cashew nut*), *Salvadora persica, Erythrina indica, Ficus tomentosa, Pongamia glabra* and other littoral species.

A short-stemmed tree with a thick, often crooked, cylindrical trunk. Bark dark-coloured, scaly, fissured. Wood reddish-brown, moderately hard and close grained. Pores large and medium-sized, arranged in groups and lines, often filled with a gum-like material. Medullary rays very fine and numerous and crossed horizontally by wavy, continuous or broken, narrow lines of deep red-coloured tissue. A cross section shows broad lustrous patches. Average weight 42 lbs. to the cubic foot; used in the construction of native pattimars and other

craft, (knees and bent timbers). The oil from the seeds known as "Bitter Oil" is used in medicine, for burning and for painting wood-work.

2. C. tomentosum, Wgt. Ic. t. 110; Fl. Br. I. 1, 274; Bedd. Fl. Sylv. 22. *C. augustifolium,* Dalz. & Gibs. Bomb. Fl. 32; (not of Roxb); Cooke Fl. Pres. Bomb. 1, 80; Gamble Ind. Timb. 57. *C. elatum,* Bedd. Fl. Sylv. I. c. 22. *Poon Spar, Sirpoon-tree, Nagari,* M. *Shri honay, surhoni.* K.

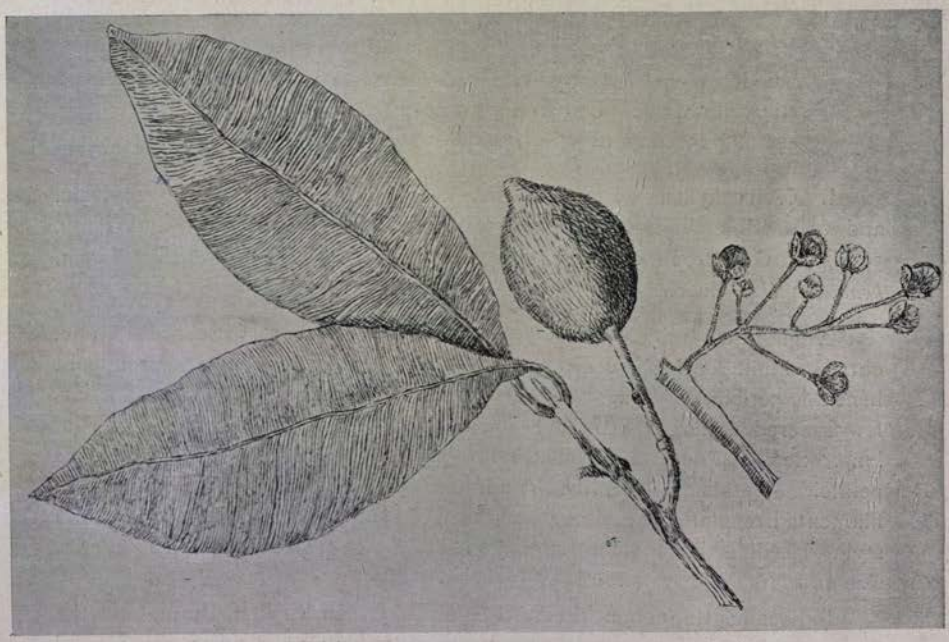


Fig 62. Calophyllum tomentosum, Wgt.

A very large, tall, cylindrical-stemmed tree; branchlets 4-angled; young parts more or less rusty-tomentose. Leaves coriaceous, glabrous, shining; margins wavy, narrowly elliptic or linear-lanceolate, acuminate; blade 6″ by 2″; parallel veins fine, prominent and closer set than in either of the other 2, mentioned species; petioles ·5″ long. Flowers white, ·5″ across, long pedicelled, in racemes in the upper axils or in terminal panicles; pedicels slender, tomentose. Outer 2 sepals ciliolate, smaller than the inner; two inner petaloid. Petals 4, larger than the sepals. Stamens many; filaments united at the base. Styles flexuous, exceeding the stamens; stigma peltate. Fruit sub-globose, ovoid, ·75″-1″ long, brownish-yellow; testa spongy.

Evergreen rain-forests of the W. Peninsula from the Konkan southwards up to 5000′ elevation, is also found in the moist forests of Ceylon from 2-4000′. In N. Kanara is practically restricted to the forests about Mulamane on the Gairsoppah ghát where it is locally common. Flowers during the cold season, Jan.-Feb. but not annually. Fruit ripe during June-July. This fine straight, cylindrical-stemmed tree, attains a great size in a small area of rain-forest near the Mulamune ghát of N. Kanara where trees 150′ high with a girth of 15′ at breast height are not uncommon. The bark is yellowish with long wavy vertical fissures, which readily distinguishes the species. Wood red, lustrous, coarse-grained. Pores large or medium-sized, in irregular, wavy, broken lines of dark-red tissue. Weighs about 35 lbs. to the cub. ft. Used for masts and spars of ships. In Kanara the Public Works Department makes use of the wood in the construction of bridges, principally on the ghát roads leading to the coast (Gairsoppah Ghát etc.) Col. W. Peyton who was for many years conservator of forests in N. Kanara used to relate how 2 Poon spars taken from the Mulamane forests were sold at for 1000 Rs. each. A demand for this timber for export to S. India has sprung up of late. The supply is however very limited. The seeds yield an oil used in Ceylon for burning in lamps.

3. C. Wightianum, Wall. Cat. 4847; Fl. Br. I. 1, 274; Bedd. Fl. Sylv. t. 90; Cooke Fl. Pres. Bomb. 1, 81; Gamble Ind. Timb. 58. *C. spurium,* Choisy; Dalz. and Gibs. Bomb. Fl. 32; *Bobbi,* M.; *Irai,* K.

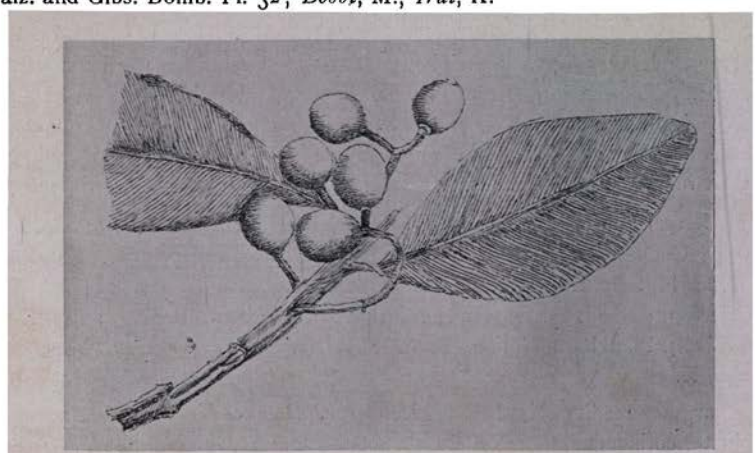


Fig 63. Calophyllum Wightianum, Wall.

A moderate-sized or large evergreen tree; branches acutely tetragonal. Leaves obovate or oblong, acuminate, coriaceous, shining above, paler beneath;

54767

blade 3″-4″ by 1·5″-2″; petioles ·25″ long. Flowers white, ·5″ in diameter, pedicelled, in axillary racemes, as long as or longer than the leaves; pedicels ·25″-·5″ long with deciduous bracteoles at the base. Outer 2 sepals enclosing the 2 inner, longitudinally veined; inner sepals petaloid. Petals usually 0. Stamens numerous; anthers large. Style flexuous, exceeding the stamens; stigma peltate, margin crenulate. Fruit small, ovoid, ·25″ in diameter, smooth, yellowish.

Western Peninsula; Ghâts from the Konkan to Travancore, often gregarious; common in the fringing forests along the banks of North Kanara rivers. Fl. Dec. Fr. March.

Bark very thick, and characteristic. Rhytidome deeply fissured, showing yellow plates of periderm; inner-bark red with much juice. Wood red-coloured, hard and heavy. Pores large and moderate-sized, arranged in short lines or groups. Medullary rays very fine, rather indistinct. Numerous bands of concentric and anastomosing lines of tissue. Weighs 54 lbs. to the cubic foot. Used to a certain extent by the natives of N. Kanara for building purposes. The timber deserves attention; it is strong, durable, with a handsome grain, well adapted for engineering and construction purposes and is also suitable for furniture and cabinet work. The edges of the leaves are often transformed into large, hollow, irregularly shaped, winged galls. This disease is very common in the N. Kanara *Bobbi* trees.

4. MESUA, L.

Trees. Leaves opposite, rigidly coriaceous; veins inconspicuous, very numerous. Flowers large, polygamous, or hermaphrodite, axillary, solitary. Sepals and petals 4 each, imbricate. Stamens numerous, free or connate at the base. Ovary 2-celled; style long; stigma peltate; ovules 2 in each cell, erect. Fruit woody, 1-4-seeded; seeds with a thin, fragile testa, exarillate.

M. ferrea, Linn., Fl. Br. I. 1, 277; Dalz. and Gibs. Bomb. Fl. 31; Bedd. Fl. Sylv. 23; Cooke Fl. Pres. Bomb. 1, 81; Gamble Ind. Timb. 591 *M. coromandelina,* Bedd. Fl. Sylv. t. 64; *M. speciosa,* Choisy; Bedd. Fl. Sylv. 23; *M. Roxburghii,* Wgt.; Bedd. Fl. Sylv. 23; *M. sclerophylla,* Thw. Bedd. Fl. Sylv. 23; *M. pulchella,* Planch. and Trian. Bedd. Fl. Sylv. 23; *Nagchampa,* M., *Nagasampige,* K.

A large or medium-sized, evergreen tree. Leaves linear-ovate, acute or acuminate, coriaceous, more or less glandular-punctate, shining above, covered with a glaucous, pruinose, waxy meal beneath; veins very fine and numerous, equally inconspicuous on both surfaces; blade 3″-4″ by 1″-1·5″; petioles ·25″ long. Flowers about 2″ across, large, white and yellow, strongly scented, terminal, solitary or crowded on the branches; pedicels thick, short; buds

large globose, pruinose. Sepals 4, orbicular, thick; margins thin, 2 outer sepals greenish, 2 inner white. Petals 4, spreading, white; margins lobed. Stamens with white filaments and yellow anthers. Ovary white, conical; stigma broad, peltate. Fruit ovoid, conical-pointed; seeds 1-4, dark-brown, smooth.

Fig 64. Mesua ferrea, L.

Mountains of E. Bengal, E. Himalaya, E. and W. Peninsulas, Tenasserim, Burmah, Assam, Ceylon and the Andamans; scattered throughout the evergreen rain-forests of North Kanara and the South Konkan, often cultivated by the Haigas in their supari gardens. Fl. March. Fr. May.

Isolated trees are occasionally found in bloom in the tropical evergreens, and covered with a mass of scented white and yellow blossom appear like great pyramids of flowers, which are always surrounded by myriads of winged insects.

A very variable species as regards the size of the flowers, width of the leaves and the amount of white, mealy covering underneath and quality of the wood.

Bark ·25" thick, dark, scaly, red within; wounds in which exude a clear gum. Wood strong, heavy, hard, with a very distinct, dark-red heartwood. Pores moderate-sized, in groups or arranged in wavy patterns, filled with resin. Medullary rays very fine, crossed by close, wavy lines of whitish tissue; difficult to work, not much used in N. Kanara where other more suitable timbers for ordinary uses are abundant. It would be an excellent wood for conversion into paving blocks. The N. Kanara supply is however limited and only small quantities are available. Weighs 62 lbs. to the cubic foot. The seeds yield a dark-coloured oil used in medicine and for burning by the Haigas. The seed cases are very astringent. The fruit is edible and the flowers yield a strong perfume.

Order XIII.—TERNSTRŒMIACEÆ.

Shrubs or trees. Leaves simple, alternate, usually serrate and coriaceous, exstipulate. Flowers regular, hermaphrodite or rarely unisexual, axillary, one or more together or in terminal or axillary racemes. Sepals 5, rarely 4-7, free or slightly connate. Petals 5, rarely 4-9. Stamens numerous, free or shortly connate at the base, usually adnate to the base of the deciduous corolla. Ovary free, sessile, 3-5-celled; styles as many as the cells, free or connate; ovules 2 or many in each cell. Fruit baccate or capsular. Seeds few or numerous; placentas axile; albumen scanty or O; embryo straight or variously bent; cotyledons large, sometimes plaited.

Fruit a berry; seeds not winged; albumen fleshy.
Anthers basifixed ... ... 1. Eurya.
Fruit a capsule; seeds winged; albumen O.
Anthers versatile... ... ... 2 Gordonia.

1. EURYA, THUNB.

Shrubs. Leaves glabrous, crenate-serrate. Flowers small, dicœcious, in axillary fascicles; bracteoles persistent. Sepals 5. Petals 5, united at the base. Stamens 15 or fewer. Ovary usually 3-celled; styles 3, free or united; ovules many, in the inner angle of each cell. Fruit a berry; albumen fleshy.

E. japonica, Thunb. Fl. Jap. 191, t. 25; Bedd. Fl. Sylv. t. 92; Fl. Br. I. 1, 284; Gamble Ind. Timb. 63.

A small or moderate-sized tree with glabrous or pubescent branches. Leaves obovate or narrow-elliptic, acute, crenulate, narrow at the base; blade 1·5″-2″ long, by 1″-1·5″ broad; petioles short, ·2″ long. Flowers 2-bracteate, white, ·2″ in diameter; pedicels axillary, usually 2-3 together. Sepals unequal, the two outer smaller, ovate, glabrous, persistent. Petals twice as long as sepals. Styles 3, distinct or united to near the apex. Fruit globose, ·2″ in diameter, glabrous, crowned by the remains of the style.

Eastern Himalaya, Sikkim, alt. 5-10,000′, Khasia Mountains, alt. 3-6,000′, E. and W. Peninsulas and Ceylon, ascending to 7,000′. Beddome says it is found at low elevations on the W. side of the Madras Presidency. I have found it on the Bababuden Hills of Mysore at about 6,000′, but have no account of it from any station in the Bombay Presidency except that given by Dr. Lisboa in his Useful Plants of Bombay which requires confirmation. There is a specimen

in the Kew herbarium collected by Dr. Stocks in the "Konkan." This tree flowers in Mysore during November. Fr. ripe January.

Wood brown, soft, close-grained, sometimes used for fuel.

2. GORDONIA, Ellis.

Evergreen trees. Leaves usually crenate. Flowers large, white, fragrant, solitary, axillary or collected at the ends of the branches, 2-4-bracteate. Sepals usually 5, unequal, graduating in size from the bracts to the petals. Petals free, the innermost larger. Stamens 5-adelphous or all connate, adnate to the petals. Ovary 3-5-celled; style simple; stigma stout, spreading; ovules 4-8 in each cell. Capsule oblong, woody, angled, dehiscent. Seeds flat, winged; albumen O.

G. obtusa, Wall. Cat. 1459; Fl. Br. I. 1, 291; Bedd. Fl. Sylv. t. 83; Gamble Ind. Timb. 67. *Nagetta*, Budaga.

A tall tree. Leaves cuneate-oblong or elliptic-lanceolate, obtuse or bluntly acuminate, glabrous, shallowly serrate-crenate; blade 3″-6″ by 1·5″-2″ broad; midrib prominent beneath. Flowers white, 1·5″ in diameter. Sepals orbicular, silky pubescent outside. Petals obcordate, slightly united at the base, silky on the outside. Stigma peltate, 4-5-lobed. Fruit a 5-angled, woody, loculicidally dehiscent capsule 1″ long.

Western Peninsula from the Konkan southwards at an elevation of 2500′-7000′; common on the Nilghiris. I have found it also on the Bababuden Hills of Mysore in the evergreen sholas, at an elevation of 5000′ but it has not yet been found in the Bombay Presidency as far as I know. Dr. Lisboa mentions it in his Useful Plants of Bombay but similarly as in the case of *Eurya japonica*, this observation requires confirmation. Flowers May-June. Fr. Nov.-Jan.

Order XIV—DIPTEROCARPACEÆ.

Trees abounding in resin. Leaves simple, entire, alternate, with lateral parallel nerves; stipules deciduous, convolute. Flowers usually sweet-scented, regular, bisexual, in few or many-flowered, axillary and terminal racemes or panicles. Bracts minute or O, rarely larger and persistent. Calyx 5-lobed; tube free or very short and adnate to the base of the ovary; 2 or more lobes usually accrescent in fruit. Petals 5, contorted, connate at the base or free. Stamens 15-10-5 or indefinite, hypogynous, or sub-perigynous, free, connate or adnate to the petals; filaments short, dilated at the base; anthers 2-celled; connective often aristate or with an obtuse appendage. Ovary slightly immersed in the torus, 1-3-celled; ovules 2 in each cell, pendulous, laterally affixed or erect with or without a fleshy stylopodium; style subulate or fleshy. Fruit free or usually winged; seeds 1-2, albuminous or exalbuminous; cotyledons fleshy, equal or unequal, straight or more or less plaited and crumpled and sometimes with long petioles; radicle superior or rarely inferior, usually included between the cotyledons.

Calyx much enlarged and winged in fruit.

Stipules large, amplexicaul, caducous. Calyx with a distinct, obconic tube.

Fruit with 2 wings ... ... 1. Dipterocarpus.

Stipules small, caducous. Calyx with a short, obscure tube.

Fruit 3-5-winged ... ... 2. Shorea.

Fruit 2-winged... ... ... 3. Hopea.

Calyx scarcely enlarged and not winged in fruit ... 4. Vateria.

1. DIPTEROCARPUS, GAERTN.

Lofty trees with cylindrical stems, stellately pubescent or more or less clothed with fascicled hairs. Leaves coriaceous, simple, entire or repand-crenate; stipules large, valvate, enclosing the terminal bud, deciduous, leaving conspicuous annular, linear, usually oblique scars. Flowers racemose or panicled, often large and showy. Calyx 5-lobed with a turbinate or urceolate, free tube; 2 of the lobes accrescent in fruit. Petals pubescent externally, spreading, slightly cohering at the base. Stamens numerous; anther-lobes equal; connective pro-

longed in a long cuspidate point. Ovary 3-celled, hairy, continued into a conical, fleshy stylopodium; style filiform; ovules 2 in each cell. Fruit free, enclosed in the enlarged calyx-tube, 1-seeded, 2-winged. Seed adnate to the base of the pericarp; cotyledons large, thick, unequal.

D. turbinatus, Gaertn. f. Fruct. 3, 51. t. 188; Fl. Br. I. 1, 295; *D. indicus*, Bedd. Fl. Sylv t. 94; Gamble Ind. Timb. 70; Brandis Jour. Linn. Soc. Vol. 31. p. 26. *Wood Oil Tree. Challane*, K.

Fig 65. Dipterocarpus turbinatus, Gaertn.

A lofty tree. Leaves coriaceous, ovate, sinuate, bluntly acuminate; base rounded; lateral nerves oblique, parallel, prominent and pubescent beneath, from 12-18 pairs; veins numerous, parallel and at right angles to the nerves; blade 12″-4″ by 6″-2″; petioles 1″-2″, hoary pubescent; stipules about 3″ long, caducous, grey-velvetty, stellate-hairy, canescent, leaving an annular scar. Flowers about 2″ across, pink, in axillary 5-8-flowered racemes which are a little shorter than the

leaves. Calyx-tube ·3″ long, obconic, obtusely angular at the base, without wings or ribs; but with 2, linear lobes ·3″ long and 3 sinuate deltoid lobes between them. Petals 1″ by ·2″, linear-oblong, grey-tomentose without, twisted to the left in bud. Stamens numerous; anthers terminated by a long slender bristle. Fruit globose, 1″ in diameter, with 2, linear, lanceolate, 3-nerved wings, which are about 5′ long by ·75″ broad, obtuse and reticulately veined and 3 short, deltoid-ovate wings; nut 1″ in diameter, globose often with hard shining drops of the wood-oil transformed on exposure on the surface; cotyledons thick, fleshy, contortuplicate, presenting the appearance and intricate pattern of a strongly ruminated albumen.

Eastern Bengal and Eastern Peninsula, from Pegu to Singapore, Western Peninsula, in the ghât evergreen rain-forests, locally distributed, from North Kanara southwards. Very abundant in South Kanara and on the southern ghâts of North Kanara in the tropical evergreen forests near the Gairsoppah falls, Nilkund ghât etc. at about 2000′ elevation, Travancore up to 3000′ I have not seen trees much over 100′ high. The wood-oil tree is, however, known to attain much greater dimensions, 200′ high by 5′ in diameter, in the Chittagong forests. Sir D. Brandis keeps *D. turbinatus*, Gaertn, temporarily distinct from *D. indicus*, Bedd., on somewhat slender grounds, viz. Length of the petiole, size of the leaf and number of the lateral nerves. Enumer. Dipterocarpaceæ, Jour. Linn. Soc. Vol. 31, p. 27. Fl. Dec.-Jan. Fr. ripe May. A very large tree with a straight cylindric trunk 100′ high by 5′-6′ in diameter and a deeply fissured and cracked bark. Wood smooth, moderately hard. Heartwood reddish brown, mottled with dark patches of tissue. Pores round, moderate-sized, included in and often joined by irregular bands of soft tissue. Medullary rays broad and fine. Weighs 57 lbs. to the cub. ft.; employed for house-building and canoes in Burma; not much used on the Western Coast. The N. Kanara timber is attacked by borers. The trunk yields a balsamic oil *(Gurjun oil)* used medicinally and for painting houses and ships. Oil is not extracted from the trees in N. Kanara.

2. SHOREA, Roxb.

Large resinous trees. Leaves entire, or sub-repand; nerves parallel, and parallel feather-veined; stipules in a few species coriaceous and persistent or generally small and caducous. Flowers bracteate, in lax, unilateral spikes or racemose panicles; bracts persistent, caducous or O. Calyx-tube short, adnate to the torus; segments ovate or lanceolate, imbricate; 3 or more, rarely all enlarged in fruit. Petals 5, twisted, imbricate, hairy outside. Stamens usually 15; anthers ovate or oblong, rarely linear; connective subulate-cuspidate; valves equal or the exterior slightly larger, obtuse, rarely cuspidate. Ovary 3-celled; cells 2-ovuled; style subulate, entire or 3-lobed at the apex. Fruit

coriaceous, indehiscent, 1-seeded, enclosed in the 3-5 unequal-winged, accrescent calyx; wings 10-veined, linear; cotyledons fleshy, unequal, usually enclosing the superior radicle, filled with starch or fat oil.

S. Talura, Roxb. Fl. Ind. 2, 618; Fl. Br. I. 1, 304; *Vatica laccifera,* W. & A.; Wight's Icones t. 164; *S. laccifera,* Heyne, Bedd. Fl. Sylv. t. 6; Gamble Ind. Timb. 82; Cooke Fl. Pres. Bomb. 1, 85 *Jhall mara,* K; *Jhallanda,* Mysore.

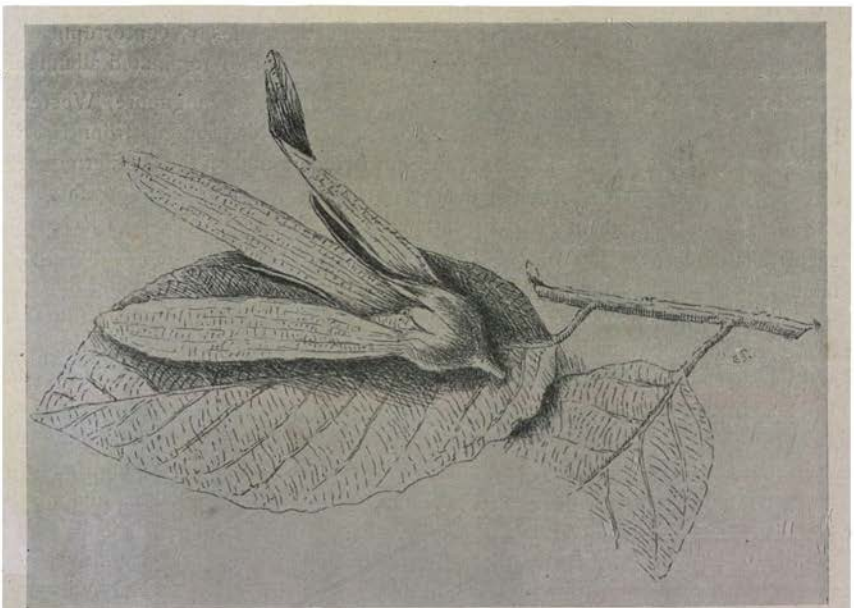


Fig 66. Shorea Talura, Roxb.

A large tree. Leaves coriaceous, glabrous above, tomentose or glabrescent beneath, elliptic, ovate, apiculate, obtuse or sometimes emarginate; base rounded or subcordate; lateral nerves 12-15 pairs, parallel, strong, with distinct, reticulate venation; blade 6″-2·5″ by 3·25″-1·2″; petioles ·75″ long. Flowers white or light-pink, 1″ in diameter, in dense, terminal or lateral, about 3″ long panicles. Calyx in flower glabrous; margins ciliolate. Petals much longer than the sepals, pubescent without. Stamens 15; appendage of connective equal in length to the anther, scabrous at the end. Ovary glabrous; style longer than the ovary; stigma 3-toothed; stylopodium O. Fruit with 5, very unequal linear wings, each 3-10 parallel-nerved with peculiar sinuous curved and raised cross veins; wings 3″-1″ by ·5″-1″; nut 1′ by ·5″, ovoid, long-pointed, rough, black, shining, and covered with resin. The broad base of the calyx compeletely encloses the fruit.

Western Peninsula; forests of Mysore and Malabar, S. Deccan districts of Madras, Cuddapah, N. Arcot and Anantapur, up to 3000′ elevation. In the Sircy taluka of North Kanara it is found scattered throughout the mixed deciduous monsoon-forests near the Mysore frontier. A large handsome tree. Bark grey with longitudinal fissures. Wood hard, compact, dark-yellowish, even-grained. Pores small, resiniferous, often in groups, enclosed in white tissue. Medullary rays moderately broad and fine, numerous, wavy, joined by transverse narrow bars of white tissue. Annual rings indistinct. Weighs 56 lbs. to the cub. ft. Used extensively for building purposes in North Kanara. Lac is not found on this tree in North Kanara. Fl. Jan. Fr. April.

3. HOPEA, Roxb.

Glabrous or tomentose, resinous trees. Leaves coriaceous, entire, firm; stipules small, deciduous. Flowers ebracteate, in lax panicled, unilateral racemes. Calyx-tube very short; segments 2, obtuse, imbricate, enlarging in fruit wing-like and erect. Petals connate, hairy outside, deciduous. Stamens 15, rarely 10; anthers ovate; connective subulate-cuspidate; cells obtuse, equal-valved. Ovary 3-celled; cells 2-ovuled; style short, terete or subulate; stylopodium large or O. Nut 1-seeded, 2-winged; seed ovoid, exalbuminuous; cotyledons green fleshy, unequal, one enclosing the other; both bifid at the base. The superior radicle is embedded in a groove between the lobes of the outer cotyledon and the remains of the dissepiments intrude between the lobes of the inner. This genus is very closely allied to *Shorea*.

H. Wightiana, Wall. Cat 6295; Fl. Br. I. 1, 309; Bedd. Fl. Sylv. t. 96; Cooke Fl. Pres. Bomb. 1, 86; Gamble Ind Timb. 74. *Haiga, hiral bogi, kurihouga,* K.; *Kavsi, kalhoni* M.

A moderate-sized tree; young branches and petioles covered with a dense, usually rufous pubescence. Leaves oblong, lanceolate, bluntly acuminate, coriaceous, glabrous or pubescent on the nerves beneath; nerves 9-12 pairs, arching and prominent beneath, midrib very strong; blade 4″-9″ by 1·5″-3″; petioles stout about ·6″ long. Flowers ·5″ across, pinkish-white, in copious, axillary, secund panicles about 6″ long, often 3 together from the same leaf-axil; pedicels short, 2-bracteolate; bracteoles scarious, often connate. Calyx glabrous; the 2 outer sepals obtuse and larger than the acute inner. Petals ciliate on the margins and grey-pubescent outside. Ovary puberulous above; stylopodium glabrous, slightly verrucose; style short. Fruit crimson; wings 2·5″ by ·5″, 7-9-nerved; cross venation similar to that in the fruit wings of *Shorea Talura*. Capsule ovoid, ·5″ long, crowned with the style remains sometimes

with shining spots of resin; 3 smaller wings unequal, usually shorter than the capsule, ·3″-·5″ long, ovate, acute. The axillary flower-buds are often attacked by an insect and transformed into a sessile, solid, globose, echinate gall, ·75″ in diameter.

Fig 67. Hopea Wightiana, Wall.

Evergreen forests of the Western Peninsula from the Konkan southwards; often gregarious in fringing forests along river banks and in the coast forests from N. Kanara to Tinnevelly. Fl. March-June. Fr. H. & R. S.

A tree with a thick stem, very handsome when covered with its bright crimson, winged fruits during the hot season. Bark smooth, exfoliating in large rectangular plates; inner bark white or yellowish, ·25″ thick. Wood dark, yellowish-grey, very hard and heavy. Pores, uniform, numerous, in small groups in the midst of the lighter coloured tissue. Medullary rays numerous, very fine.

Weighs about 65 lbs. to the cub. ft.; much used for building purposes in North Kanara and is exported from that district in considerable quantities to Calicut. The wood is also an excellent fuel.

4 VATERIA, L.

Large evergreen, resinous trees, glabrous or stellately-pubescent. Leaves coriaceous, entire; stipules small, deciduous or inconspicuous. Flowers large, pedicellate, in axillary and terminal panicles. Calyx-segments imbricate, scarcely accrescent in fruit; tube short, adnate to the torus. Stamens 40-80, the outer smaller; anthers sessile or on short filaments, linear; cells unequal, the outer longer and broader, dehiscing from apex to base. Ovary 3-celled; cells 2-ovuled; style long, filiform. Fruit large, supported by the small, persistent calyx; cotyledons thick, fleshy, unequal, usually lobed, including the superior radicle.

V. indica, L.; Fl. Br. I. 1, 313; *V. malabarica*, Blume; Bedd. Fl. Sylv. t. 84; Cooke Fl. Pres. Bomb. 1, 86; Gamble Man. Ind. Timb. 85. The *White Dammer Tree* of Southern India, *Piney Varnish,* or *Indian Copal Tree, Dhupada,* K.

A large tree with a cylindrical stem; branchlets and inflorescence covered with fine mealy-grey, stellate pubescence. Leaves glabrous, coriaceous, ovate-oblong, obtuse or very shortly acuminate, cordate or rounded at the base; lateral nerves 14 pairs, parallel, strong beneath; veins parallel; blade 5″-8″ by 2″-4″; petioles stout, 1″-1·5″ long. Flowers white, ·75″ across, in large mealy-pubescent, terminal corymbs; pedicels ·5″-1″ long. Calyx nearly divided to the base into 5, obtuse, pubescent segments, reflexed in fruit. Petals glabrous, obtuse, slightly exceeding the sepals, often slightly connate at the base. Stamens 50; anthers yellow, glabrous, nearly sessile; appendix of connective long-apiculate. Style longer than the stamens, filiform; stigma acute. Fruit ovoid, 3-valved, coriaceous, fleshy, grey outside, 2″-2·5″ long; seed large; cotyledons thick, fleshy unequal, filled with fat *(Piney tallow).*

Western Peninsula from North Kanara to Travancore and Ceylon, in evergreen rain-forests ascending to 4000′, often planted. A large, handsome tree with smooth grey bark and a cylindrical stem, sometimes 5′ in diameter. Sapwood white; heartwood grey, rough. Pores large, subdivided, few. Medullary rays moderately broad and fine, white, distinct. Weighs about 26lbs. to the cub. ft. The timber is not much in request. The stems are sometimes made into canoes in North Kanara, but not often. Yields the *Piney* gum-resin which exudes from wounds in the trunk, and which makes an excellent varnish for

carriages and furniture. The seeds yield 50% of a kind of tallow, *Piney tallow* or *vegetable butter*. The bark is very astringent. Colonel Beddome in his Flora Sylvatica says: "*V. indica*, is only found in Ceylon. *V. malabarica*, is the Western Peninsular species." This latter has been reduced to *V. indica*, L., in the Fl. Br. I. by Sir W. T. Dyer. The larger fruit and double bristle-pointed anthers of the Ceylon plant not being considered specific characters. Sir D. Brandis in his recent work on the *Dipterocarpaceæ* also adheres to this opinion

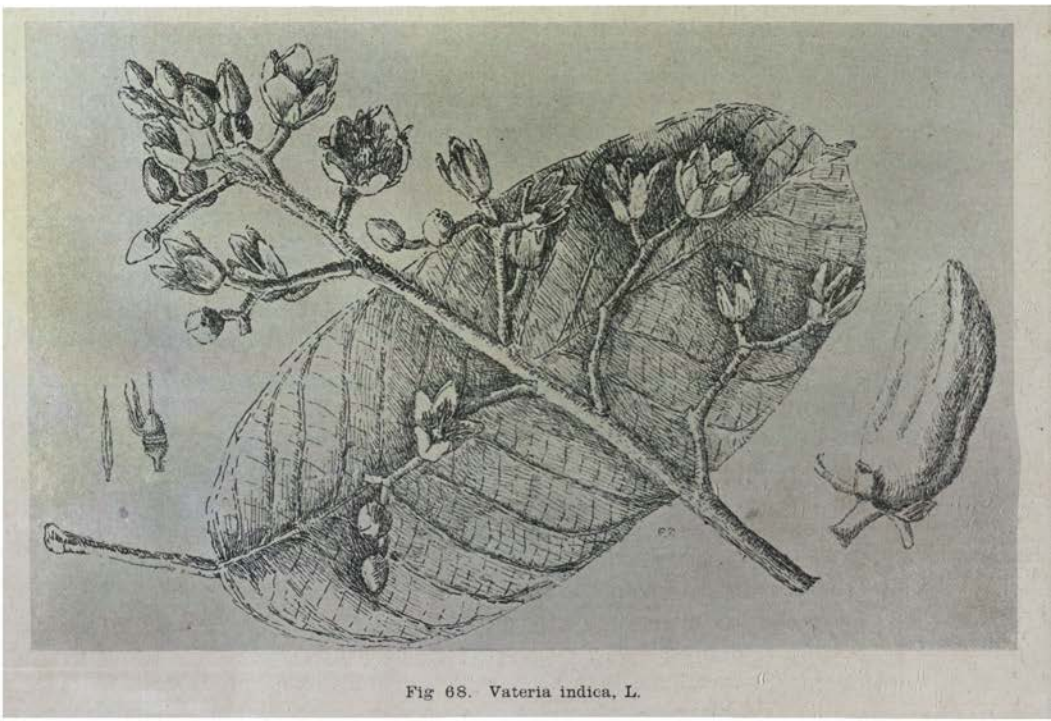


Fig 68. Vateria indica, L.

In North Kanara this tree was formerly planted along avenues or roads by the Sonda kings. A fine avenue of old *Dhupada* trees exists at the present day near Siddapore, evidently from this origin. Colonel Beddome states that the avenue of this tree near the sea coast at Karkul is a beautiful sight. The cohering petals cover the ground during the months March and April, when they are accompanied by the yellow masses of equally deciduous anthers. The bright red young leaves appear during the cold season. The fruit ripens during the rainy season.

Order XV.—ANCISTROCLADACEÆ.

Climbing shrubs with circinately-hooked branches. Leaves usually in terminal tufts, coriaceous, entire. Flowers regular, bisexual, in terminal or

Fig 69. Ancistrocladus Heyneanus, Wall.

lateral panicles. Calyx-tube short; lobes unequally enlarged in fruit. Petals 5, alternate with the sepals, contorted in bud and slightly connate at the base.

Stamens 5-10, 1-seriate; filaments dilated and connate at the base; anthers apiculate or muticous. Ovary 1-celled, inferior; styles 3, articulated to a rounded disk; ovule solitary. Fruit crowned with the accrescent spathulate, calyx-wings. Seed sub-globose; albumen copious, fleshy, ruminated; embryo short, straight; cotyledons short, divergent. No resin ducts.

1. ANCISTROCLADUS, WALL.

A. Heyneanus, Wall, Cat. 7262; Fl. Br. I. 1, 229; Dalz. & Gibs. Bomb. Fl. 34; Cooke Fl. Pres. Bomb. 1, 87; Gamble Man. Ind. Timb. 86. *Kardor, kurdul*, M.

A large, evergreen, woody climber. Leaves obovate or oblanceolate, narrowed at the base, sessile, acute or obtuse, quite glabrous and shining; lateral veins inconspicuous but possessing a fine, strongly developed reticulation; blade 8″-4″ by 2″-1·5″. Flowers ·5″ across, very deciduous, in terminal, bifurcate panicles, shorter than the leaves. Calyx-lobes unequal, as long as the petals. Petals ·25″ long, obovate, thick, yellow, imbricate, twisted. Stamens 10; 5 longer with red filaments; anthers basifixed, introrse. Fruit with 5, unequal, spreading, spathulate wings; longest 1·5″ by ·5″; nerves numerous, anastomosing.

Western Peninsula from the Konkan to Travancore. On the ghâts of North Kanara, common in evergreen rain-forests. Fl. March. Fr. April.

Order XVI.—MALVACEÆ.

Herbs, shrubs or soft-wooded trees. Leaves alternate, simple, rarely compound, stipulate, often palminerved. Flowers bracteolate, axillary or terminal, regular, hermaphrodite or uni-sexual; bracteoles O or 3 or more; sometimes combined and forming an epicalyx. Sepals 5, valvate, free or connate. Petals 5, twisted, imbricate. Stamens numerous, monadelphous; anthers 1-celled; pollen globose, muricate. Ovary syncarpous; carpels usually numerous, often whorled round a central axis; styles more or less connate; stigmas globose, peltate or linear; ovules 1 or more, curved, attached to the inner angle of each carpel. Fruit a dehiscent capsule or a number of distinct carpels. Seeds hairy, silky or woolly; albumen scanty, mucilaginous or O; embryo curved; cotyledons leafy, usually folded or crumpled.

Staminal-column tubular, entire.
- Stigmas 10, spreading. Bracteoles 10. Ovary 10-celled .... 1. Decaschistia.
- Stigmas 5 spreading. Bracteoles 5 or more. Ovary 2-5-celled .... 2. Hibiscus.
- Stigmas coherent, club-shaped.
  - Bracteoles 3-5, linear, deciduous. Ovary 4-5-celled 3. Thespesia.
  - Bracteoles 3, large, cordate, not deciduous. Ovary 5-celled .... 4. Gossypium.

Staminal-column tubular at base only.
- Filaments 5-adelphous or free.
  - Leaves simple. Bracteoles 4-6 .... 5. Kydia.
  - Leaves digitate. Bracteoles 2.
    - Seeds glabrous .... 6. Adansonia.
    - Seeds woolly. Bracteoles O.
      - Filaments with single anthers .... 7. Bombax.
      - Filaments with 2-3 anthers .... 8. Eriodendron.

1. DECASCHISTIA, W. A.

Tomentose shrubs. Leaves entire or lobed. Flowers large, shortly pedicelled; involucral bracteoles 10. Calyx 5-lobed. Staminal-tube with numerous

short filaments below the apex. Ovary 10-celled; styles 10, connate below; stigmas capitate. Capsule loculicidally 10-valved, hispid; seeds kidney-shaped, smooth.

D. trilobata, Wgt. Ic. 1, t. 88; Fl. Br. I. 1, 332; Dalz. & Gibs. Bomb. Fl. 21; Cooke Fl. Pres. Bomb. 1, 103.

A robust, tomentose, sometimes gregarious shrub. Leaves usually deeply 3-lobed; lobes lanceolate, serrate 4″-2″ by ·4″-1″; upper leaves often reduced

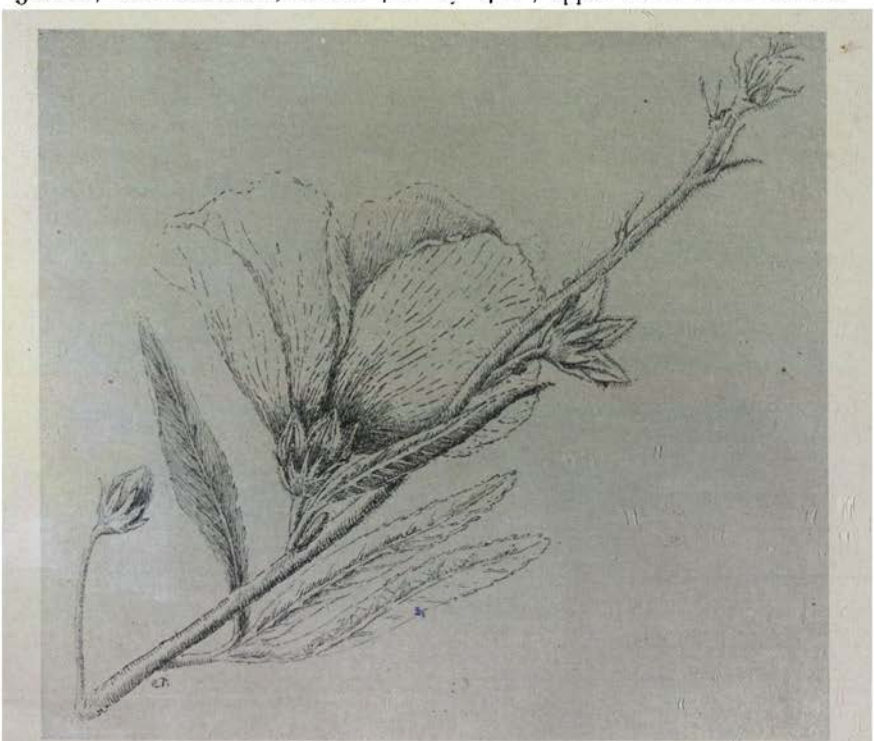


Fig 70. Decaschistia trilobata, Wgt.

to 1 narrow lobe; venation strong and conspicuous on the white-tomentose or reddish-green underside of the leaves; midrib often glandular at the base; petioles 1·4″-·25″ long; stipules ·75″ long, linear or 3-lobed. Flowers large, 2″ across, solitary or collected in the upper leaf-axils and forming terminal racemes; involucral bracteoles 10, connate at the base into a cup, tomentose, half as long as the calyx, ·5″ long; lobes connate and cup-shaped at the base. Corolla yellow with a crimson centre; petals hairy outside. Capsules hispid; seeds smooth.

Western Peninsula; Mysore, Konkan and the Deccan. On the Konkan and Supa Ghâts of North Kanara; locally abundant in open situations, Fl. Oct-Nov. Fr. C. S.

2. HIBISCUS, MEDIK.

Herbs, shrubs or trees. Leaves stipulate, usually more or less palmately-lobed. Inflorescence axillary; bracteoles 5 or more, rarely fewer or O, free or connate at the base. Calyx 5-divided, valvate, sometimes spathaceous and circumciss. Petals 5, connate at the base with the staminal-tube. Staminal-tube truncate or 5-toothed at the summit. Ovary 5-celled; cells opposite to the sepals; each with 3 or more ovules; styles 5, connate below; stigmas capitate or sub-spathulate. Capsule 5-valved or spuriously 10-celled. Seeds glabrous, hairy or woolly.

Prickly climber.

Bracteoles distinct, forked at the apex. Capsule globose, 5-celled.... .... 1. H. furcatus.

Erect trees.

Bracteoles leafy free. Capsule depressed-globose, softly hispid, ·75″ across and 5-celled .... 2. H. collinus.

Bracteoles connate above the middle and adnate to the calyx-tube. Capsule ovoid, thinly pilose, ·5″ long, spuriously 10-celled with false dissepiments .... 3. H. tiliaceus.

1. H. furcatus, Roxb. Fl. Ind. 3. 204; Fl. Br. I. 1, 335; Dalz. & Gibs. Bomb. Fl. 19; Cooke Fl. Pres. Bomb. 1, 106. *Huli gowri*, **K.**

Stem slender, very prickly; prickles recurved with a bulbous base. Leaves palmately 3-5-lobed or entire, cordate, pubescent; margins crenate-serrate, prickly on the nerves beneath; blade 2″ across; petioles 1·5″-2″ long. Flowers large, 3″-4″ in diameter, scattered, yellow with a purple centre; bracteoles 8-12, narrow, linear, forked about the middle. Calyx enlarged in fruit, very hispid; sepals lanceolate ·5″ long, covered with shining bristles; peduncles prickly, as long as the petioles. Capsule ·5″ long, ovoid, pointed, enclosed in the enlarged calyx.

Throughout the Tropics; hotter parts of India from Bengal to Ceylon; common in many of the North Kanara and Konkan moist rain-forests. Fl. Jan-Feb. Fr. H. S. A large, climbing, rambling shrub, with slender branches.

Fig 71. Hibiscus furcatus, Roxb.

Bark fibrous, dotted with brown lenticels. Wood white, moderately-hard. Yields an excellent fibre. Roots infused in water make a cooling drink for the hot weather.

2. H. collinus, Roxb. Fl. Ind. 3, 198; Fl. Br. I. 1, 338. Cooke Fl. Pres. Bomb. 1. 108.

A small tree. Leaves long-petioled, subcordate at the base; blade 5″-2″ by 5″-2″, more or less deeply trilobate; lobes acuminate; margins irregularly toothed, repand, glabrescent above, hairy beneath, 5-basal-nerved; petioles up

to 3″ long; stipules short, subulate. Flowers axillary, solitary, on long peduncles; peduncles 3″ long, articulate to a short, thick, flowering stalk, ·25″ long; bracteoles 6-8, free, shorter than the calyx, ovate, acute, ·7″ by ·25″, margins sinuate. Calyx-lobes nerved, ·75″ by ·4″, ovate, acute, united at the base into a shallow cup. Corolla 3″-4″ across, white or pinkish, with a crimson centre. Fruit depressed-globose, 1″ in diameter, somewhat obtusely 5-angled, densely brown and softly hispid; seeds globose, smooth.

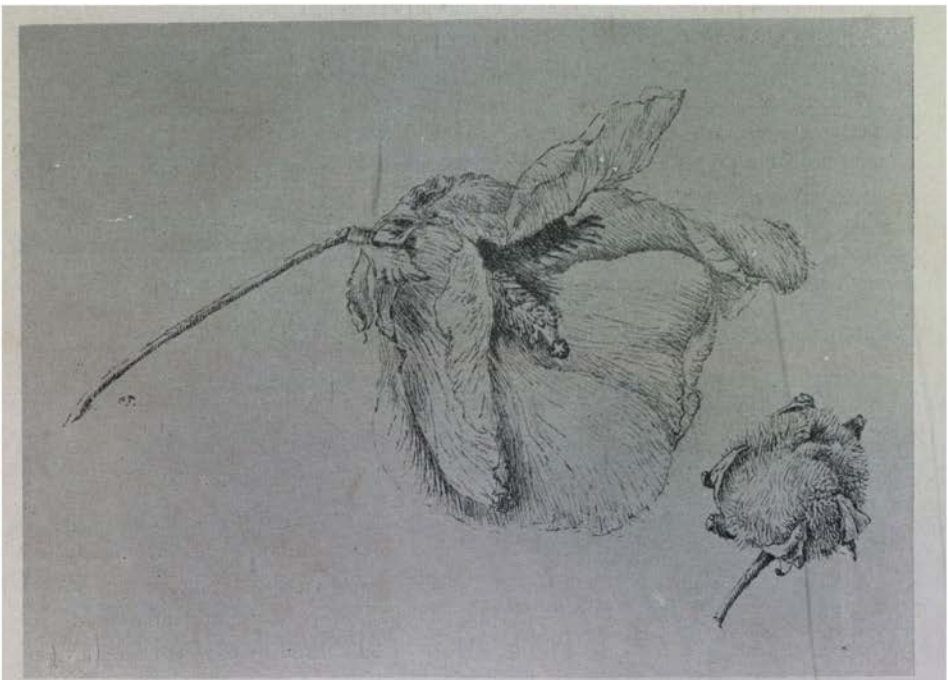


Fig 72. Hibiscus collinus, Roxb.

Circars and Coromandel, Ceylon; cultivated in gardens at Poona. Flowers at different times throughout the year. This tree has not apparently been observed wild in the Bombay Presidency. It was found in Dr. Stock's herbarium but without locality specified.

3. H. tiliaceus, Linn.; Fl. Br. I. 1, 343; Bedd. Fl. Sylv. 29; Cooke Fl. Pres. Bomb. 1, 112; Gamble Ind. Timb. 87; *Paritium tiliaceum*, W. & A.; Dalz. & Gibs. Bomb. Fl. 17. *Bellipata*, Vern.

A small tree or branching shrub; young parts pubescent. Leaves suborbicular, abruptly acuminate, crenate, cordate, glabrous above, hoary beneath; blade 3″-5″ across; petioles 1·5″-2″ long; nerves 7, basal. Flowers axillary or terminal with broad, tomentose, caducous bracts at the base of the short, thick pedicels; bracteoles 7-10, lanceolate, acute, connate above the middle and shorter than the calyx. Calyx ·4″ long; lobes triangular-acute, grey-downy on the outside. Corolla campanulate, pubescent outside, 3″-4″ across, yellow, (turning red in the evening) with a purple centre. Capsule ovoid, pointed, spuriously 10-celled, 5-valved, tomentose; seeds reniform, black, thinly pilose.

Along the banks of tidal rivers near the sea coasts of both the Eastern and Western Peninsulas; Bengal, Sundarbunds and Ceylon, Konkan and North Kanara; generally distributed throughout the tropics of the old world. Fl. Jan. and probably throughout the year. Fr. March-Apl. Bark smooth, grey; inner bark fibrous. Wood light, white, porous. Pores moderate-sized, usually subdivided. Medullary rays fine and moderately broad; weighs 35 lbs. to the cub. ft.; used only for fuel. Fibre strong, used for elephant-timber-dragging ropes in N. Kanara; it is readily separated and has the advantage of not being easily rotted in water. In Ceylon it is used for making mats. Gamble suggests that it should be useful for paper making.

H. hirtus, Linn. Sp. Plant. 694; Dalz. & Gibs. Bomb. Fl. 20; Fl. Br. I. 1, 335; Cooke Fl. Pres. Bomb. 1, 106.

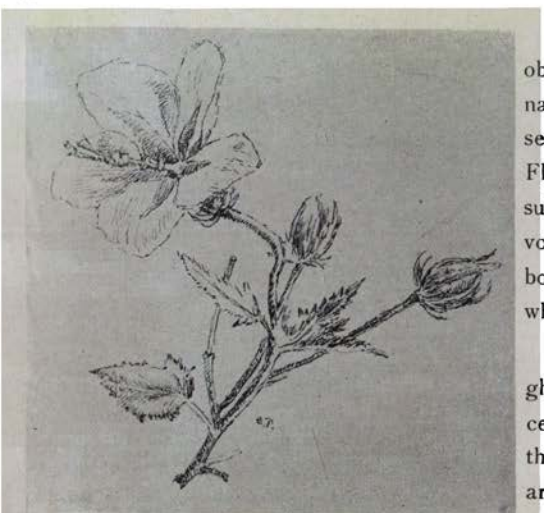


Fig 73. Hibiscus hirtus, Linn

A small shrub. Leaves oblong, 3″-5″ by 1″-2·5″, acuminate, often lobed, irregularly serrate, hairy on both surfaces. Flowers white, medium-sized, subtended by 6-9, subulate involucral bracts. Capsule globose; seeds covered with long white hairs.

Common along the Konkan ghâts also in the Satpuras, ascending to 3700′ in the Akrani; throughout the monsoon-forest areas of N. Kanara. Fl. Oct. May.

H. tetraphyllus, Roxb. Hort. Beng. 52; Fl. Br. I. 1, 341; Cooke Fl. Pres. Bomb. 1, 111; *H. Warreensis,* Dalz. & Gibs. 19. *Ran-bhendy*, Vern.

A large, erect, hairy annual. Leaves palmately 5-7-lobed, 3″-4″ in diameter. Flowers large, yellow with a crimson centre; buds enclosed in 4, large involucral bracts. Sepals connate, splitting down one side. Fruit 1·5″ long, ovoid, cuspidate, hispid; seeds nearly glabrous.

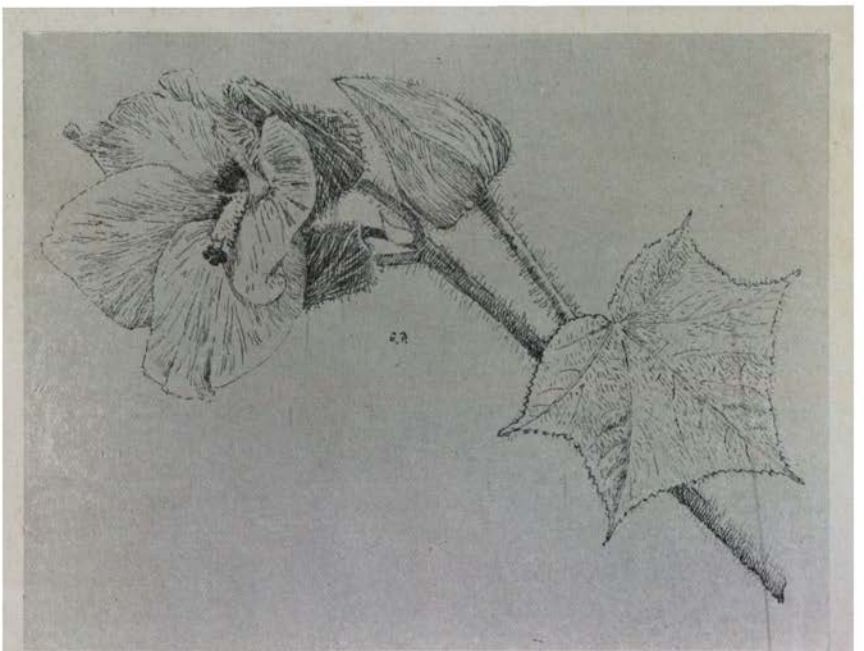


Fig 74. Hibiscus tetraphyllus, Roxb.

Widely spread throughout the presidency in the undergrowth and in open places in monsoon-forests. Fl. R. S. Sept.-Oct.

There are 15 or 16 other herbaceous and shrubby, mostly nonforest species, indigenous in the Bombay Presidency which are not included in the present work.

3. THESPESIA, Corr.

Trees or shrubs. Leaves entire or lobed. Inflorescence axillary; bracteoles 5-8, deciduous. Calyx truncate, 5-toothed or 5-partite. Corolla large, yellow; centre purple. Staminal-tube 5-toothed at the apex. Ovary 4-5-celled;

style club-shaped, 5-furrowed; ovules few in each cell. Capsule dehiscent or indehiscent; seeds glabrous or tomentose; cotyledons conduplicate, black-dotted.

A shrub. Leaves lobed. Seeds glabrescent ... 1. T. Lampas.

A tree. Leaves entire. Seeds pilose or powdery 2. T. populnea.

1. T. Lampas, Dalz. & Gibs. Bomb. Fl. 19; Fl. Br. I. 1, 345; *T. macrophylla*, Blume, Bijdr. 75; Cooke Fl. Pres. Bomb. 1, 114; Gamble Ind. Timb. 88. *Ranbhendy,* M.

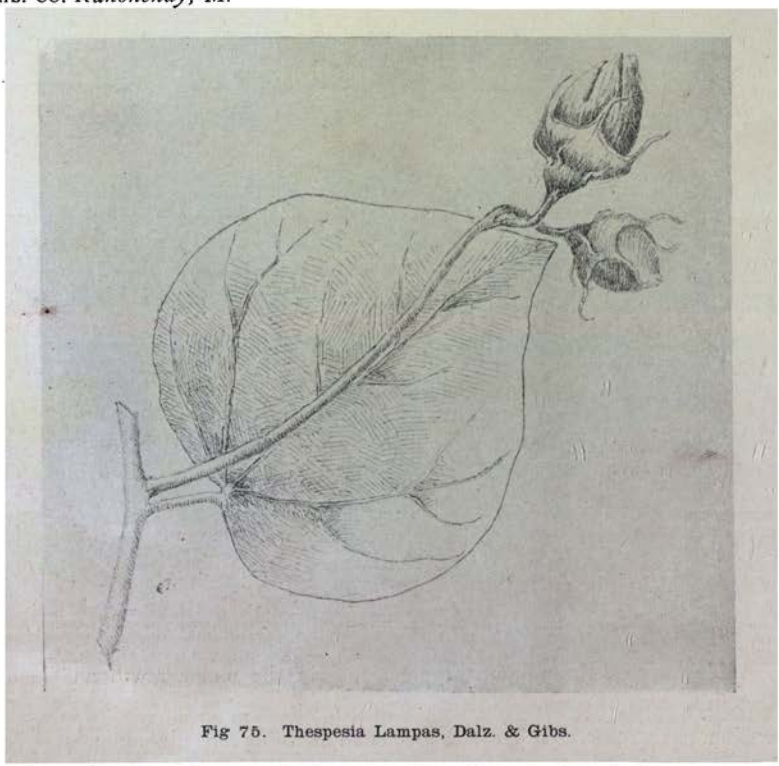


Fig 75. Thespesia Lampas, Dalz. & Gibs.

A small or sometimes rather large shrub, not much branched; young parts densely brown, scaly-tomentose. Leaves entire or more or less palmately 3-lobed, cordate, or truncate at base, acuminate, sparingly stellately-pilose, glandular-dotted beneath, glabrescent above; midrib glandular with a small pore at the base beneath; basal nerves 2-5; blade 2″-6″ by 1·25″-5″; petioles 1·5″ long. Flowers on long, axillary, 3-flowered peduncles; bracteoles 5, subulate, deciduous. Calyx-tube truncate; limb of 5, usually short or some-

times long teeth. Corolla small or large 1″-3″ in diameter, yellow with a crimson centre. Capsule ovoid, 3-5-valved, dark-coloured, scabrous outside, white within; seeds numerous, covered with dense brown pubescence, or glabrescent.

Tropical Himalaya from Kumaon eastwards, Bengal, Western Peninsula, Burma and Ceylon; common in the Konkan and North Kanara monsoon-forests from the sea-level up to 4000′, found at 3700′ in the Satpuras, (Akrani). Fl. Aug.-Oct. Fr. Nov.-Dec. This species is very variable in size (small shrub to small tree); amount of pubescence; size and shape of the leaves; size of the flowers; length of the calyx-teeth and number of the valves of the fruit.

2. T. populnea, Corr. in Ann. Mus. IX. 290; Fl. Br. I. 1, 345; Dalz. & Gibs. Bomb. Fl. 18; Bedd. Fl. Sylv. t. 63; Cooke Fl. Pres. Bomb. 1, 114; Gamble Ind. Timb. 88. *Bhendy, Tulip* or *Portia Tree; Parascha jhad,* H.; *Parascha pipla,* Guz.

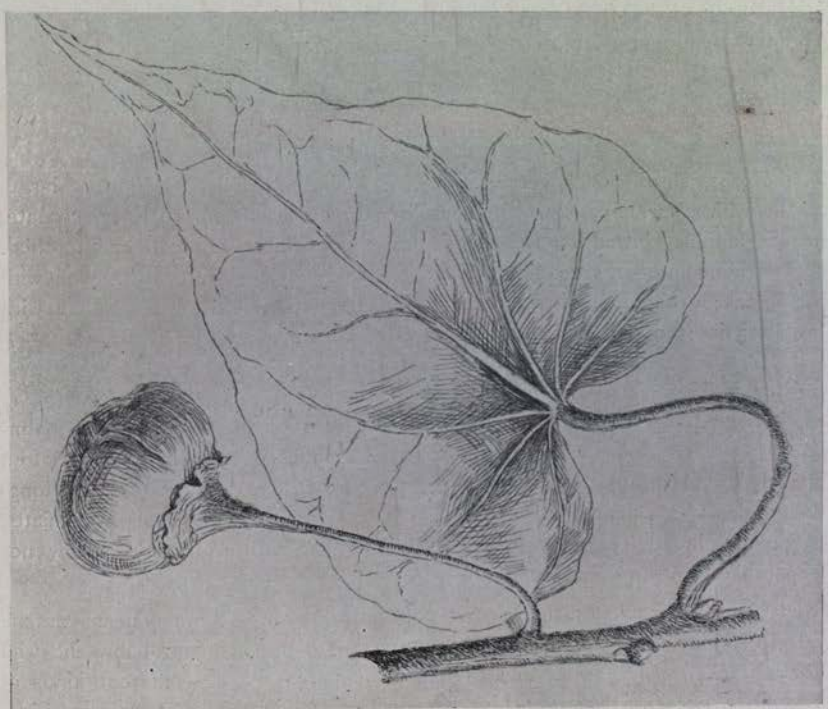


Fig 76. Thespesia populnea, Corr.

A small tree; young parts covered with brown, peltate scales. Leaves entire, ovate, deeply cordate, acuminate, 5-7 basal-nerved and often with glandular pores in the spaces between the nerves at the top of the petiole beneath; limb 3″-7″ by 3″-4″; petioles 2″-4″ long. Flowers large, 2″-3″ across, yellow with a purple centre, on stout, axillary peduncles which are shorter than the petioles; bracteoles deciduous or O as long as or shorter than the cup-shaped, 5-toothed calyx. Fruit depressed, peltate-scaly, globose, indehiscent, 1·5″ in diameter, 5-celled; seeds ovoid ·35″ long, pubescent.

Tropical shores of Bengal, Ceylon and both E. & W. Peninsulas. Along the sea-shores of the Konkan and North Kanara; often cultivated as a road-side tree. Fl. C. S. Fr. R. S. A small or medium-sized, evergreen tree with smooth, grey bark. Wood fine-grained, tough, durable, dark-coloured; sapwood soft, pale-reddish. Pores moderate-sized, subdivided, scanty. Medullary rays fine, uniform. Weighs about 50 lbs. to the cubic foot. Used for gun-stocks, wheel-spokes, and for boat-timber; also for carts and furniture. Bark yields a good fibre and the capsules a yellow dye like gamboge. The bark and wood contain tannin and a fine red colouring matter.

4. GOSSYPIUM, L.

Herbs, shrubs or low trees. Leaves palmately lobed. Flowers large, yellow with a purple centre or all purplish; bracteoles 3, large, leafy, cordate, black glandular-dotted like the calyx. Calyx cup-shaped, truncate or 5-toothed. Petals convolute or spreading. Ovary 5-celled; style clavate, 5-grooved with 5 stigmas; ovules many in each cell. Capsule 3-5-valved; seeds clothed with woolly hairs; cotyledons leafy, black-dotted, plicate.

G. Stocksii, Mast.; Fl. Br. I. 1, 346; Cooke Fl. Pres. Bomb. 1, 116.

A low diffuse rambling or climbing, much branched shrub. Leaves palmately 3-5-lobed; lobes rounded, acute, stellately pubescent on both sides, often black glandular-dotted beneath; blade ·5″ to 1·25″ across; petioles ·5″-1″ long. Peduncles 1″-2″ axillary, 1 to several-flowered; bracteoles broad, deeply laciniate; segments linear, 1-nerved. Corolla yellow, ·75″ across. Cotton yellow not separable from the seeds.

Limestone rocks on the sea-coast of Sind, apparently common near Karachi. Fl. Dec.-Jany. Fr. Feb.-Mar. An interesting plant, being probably the wild form of *G. herbaceum*, L. and therefore the parent of the different kinds of *Indian cotton*; *G. herbaceum*, Linn. *G. barbadense*, Linn. and *G. arboreum*, Linn. all cultivated species.

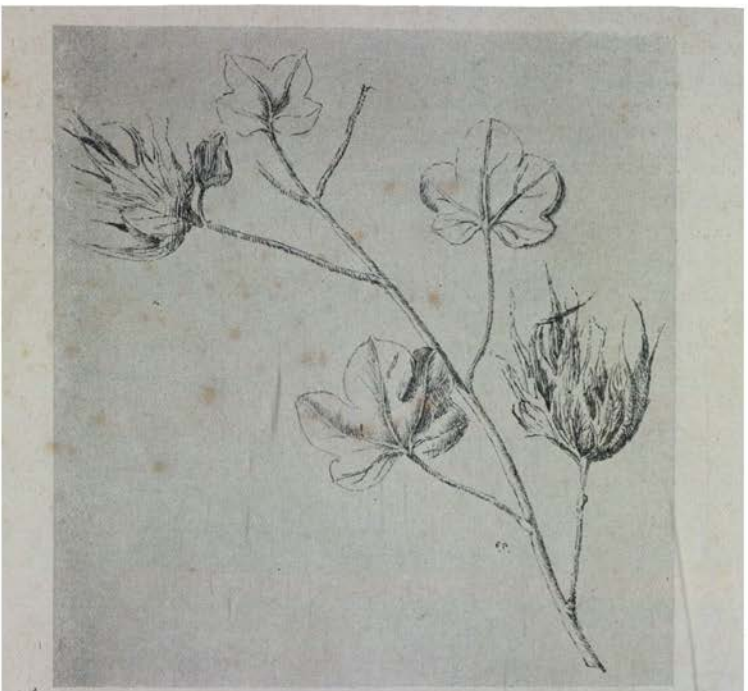


Fig 77. Gossypium Stocksii, Mast.

5. KYDIA, Roxb.

Trees. Young leaves, branches, inflorescence, capsules, etc., covered with a grey or reddish-stellate tomentum. Leaves palminerved, usually lobed, with a raised gland on the midrib, ·75″ from base. Flowers unisexual. Calyx 5-lobed, persistent, surrounded at the base with the 4-6 small leafy bracteoles which are accrescent in fruit. Petals 5, longer than calyx, attached to the base of the staminal column. Stamens monadelphous; the tube divided into 5 divisions, each bearing 3 anthers which are imperfect in the female flower. Ovary 2-3-celled; style 3-cleft; stigmas 3, peltate, imperfect in the male flower; ovules 2 in each cell. Capsule subglobose, 3-valved; seeds reniform, furrowed.

K. calycina, Roxb. Fl. Ind. 3, 188; Fl. Br. I. 1, 348; Dalz. & Gibs. Bomb. Fl. 24; Bedd. Fl. Sylv. t. 3; Brandis For. Fl. 29; Cooke Fl. Pres. Bomb. 1, 94; Gamble Man. Ind. Timb. 89. *Warung, iliya, bhendy,* M., *Bellaka, billu-bhendy,* K. *Bothi,* Bhil.

A small, deciduous tree. Leaves lobed, angled or round, cordate, palmately 7-nerved; midrib with a raised gland 1/5 way up, sparsely stellately-tomentose above, grey-felted beneath; blade 4″-5″ by 3″-4″; petioles 1·5″-3″ long. Flowers ·5″ across, in axillary or terminal, much branched panicles. Petals white or purplish, longer than the calyx, ciliate on the margins and hairy at the base of the claw, parallel-veined; bracteoles oblong-spathulate, downy, forming a persistent, accrescent involucel. Capsule small, globose, loculicidally 3-valved, fuscous-tomentose; seeds reniform, dark-brown.

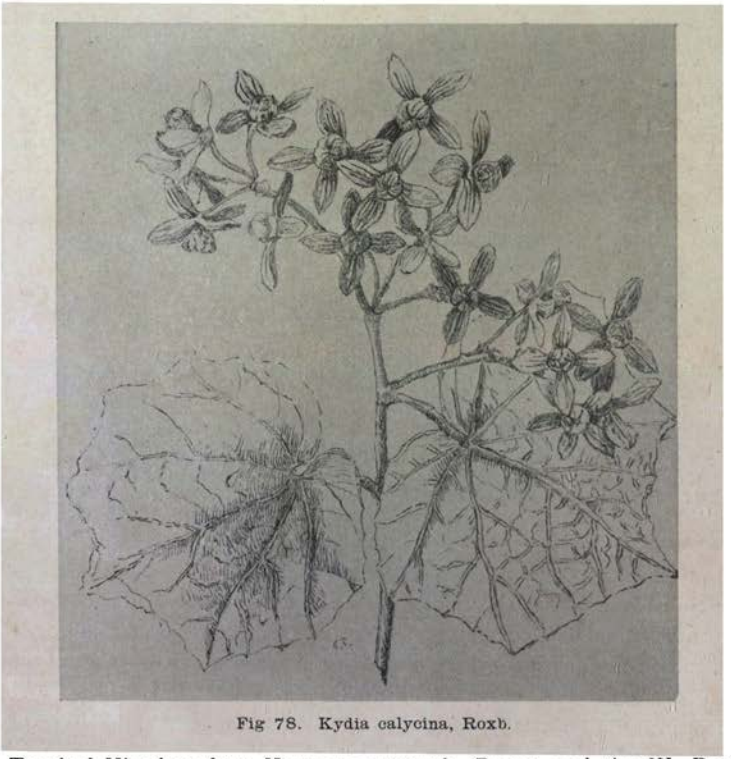


Fig 78. Kydia calycina, Roxb.

Tropical Himalaya from Kumaon eastwards, Burma and the W. Peninsula along the ghâts; common in the deciduous forests of North Kanara and the Konkan; sometimes also found inland on the dry Deccan hills of the Poona district; ascends to 3700′ in the Satpuras (Akrani). Attains a height of 30′ to 40′ with a diameter of over 1′. Coppices well and has a quick growth. Bark thick, viscid mucilaginous within; brown, wrinkled and scaly outside. Wood white or dark-grey, soft; no heartwood. Pores moderate-sized, single or subdivided. Medullary rays fine or moderately broad, joined by distinct lines of

white tissue. Weighs about 40 lbs. to the cub. ft. Used for house-building, agricultural implements and carving in Madras but in the Bombay Presidency it is generally considered practically valueless as timber. The inner bark is used for elephant timber-dragging ropes in N. Kanara. Flowers from July till Jany. Fruit Jany.-Feb., remains long on the trees.

6. ADANSONIA, L.

Tree with a short trunk, very thick at the base. Leaves digitate, deciduous Flowers axillary, large, pendulous, long-peduncled. Calyx 5-cleft, 2-bracteolate. Petals 5. Staminal-tube cylindrical, dividing above into numerous filaments; anthers uniform. Ovary ovoid, silky-tomentose ; style filiform, bent after flowering. Fruit a pendulous, woody capsule with mealy pulp; seeds reniform ; testa thick; albumen thin; cotyledons contortuplicate.

A. digitata, Linn. Fl. Br. I. 1, 348; Brandis For. Fl. 30; Dalz. & Gibs. Bomb. Fl. Suppl. 9; Cooke Fl. Pres. Bomb. 1, 119; Gamble Ind. Timb. 86. *Gonik chentz,* M.; *Goruk amla,* H. *The Baobab,* or *Monkey Bread Tree* of Africa.

Planted here and there throughout the presidency and in Ceylon, common in places along the sea coast, north of Bombay, supposed to have been originally introduced by Arabs but probably was also brought by the Portuguese from tropical E. Africa where it is endemic. Fl. May-June. One of the thickest-stemmed trees in existence. Trunks 30′ in diameter, are common in Africa (Senegal). Wood light, soft and porous. Growth very rapid, large trees are supposed to be of great age, but several I observed in the Dharwar and Bijapore districts were fairly large and very probably not more than 30 or 40 years old.

7. BOMBAX, L.

Large deciduous trees. Leaves digitate, deciduous. Flowers axillary or subterminal. Calyx cup-shaped, truncate or 3-7-lobed. Petals large, scarlet, obovate. Stamens pentadelphous; each bundle divided into numerous filaments. Ovary 5-celled; stigmas 5; ovules many in each cell. Capsule 5-valved, woolly within; seeds woolly; testa thin; albumen scanty; cotyledons much folded round the straight radicle.

Leaflets 5-7. Calyx not prickly. Stamens 75; filaments thick. Ovary glabrous ... ... 1. B. malabaricum.

Leaflets 7-9. Calyx prickly. Stamens about 400; filaments filiform. Ovary tomentose ... ... 2. B. insigne.

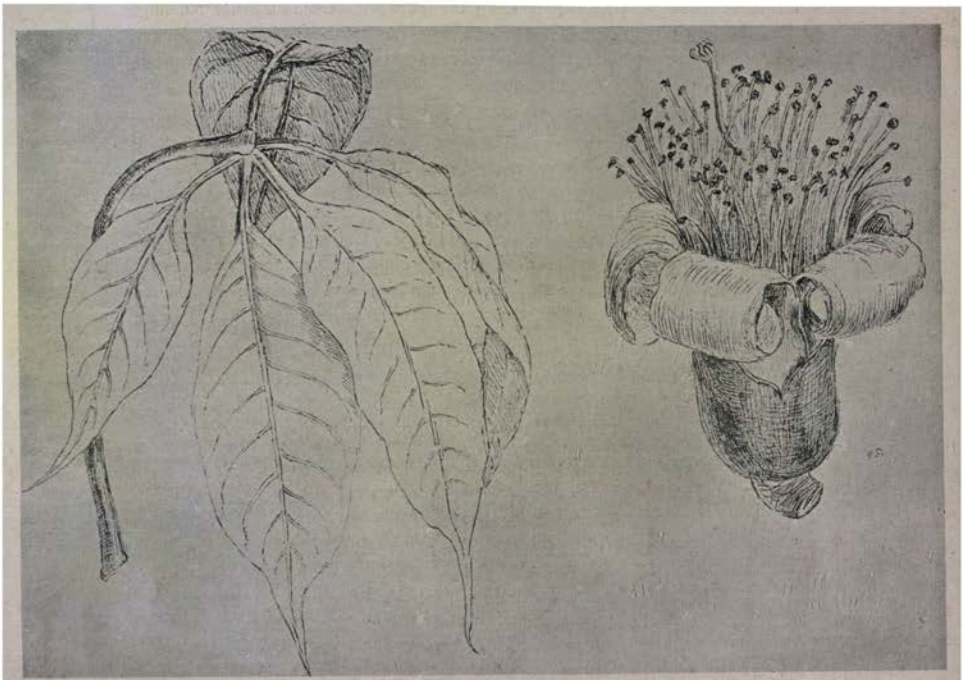


Fig 79. Bombax malabaricum, DC.

1. B. malabaricum, DC. Prodr. 1. 479; Fl. Br. I. 1, 349; Brandis For. Fl. 31; Bedd. Fl. Sylv. t. 32; Cooke Fl. Pres. Bomb. 1, 120; Gamble Man. Ind. Timb. 90; *Salmalia malabarica,* Schott; Dalz. & Gibs. Bomb. Fl. 22. *The Silk Cotton Tree. Burla, sauri,* K.; *Sayar,* M. *Semul,* Vern.

A very large tree of rapid growth; young stems and branches covered with conical prickles. Leaves petioled; petioles as long as or longer than the leaflets; leaflets shortly petiolulate, glabrous, ovate-acuminate, entire, 4″-8″ by 1·25″-2·25″. Flowers large, scarlet, rarely white, fascicled at or near the ends of the branches. Calyx cup-shaped, usually 3-lobed, smooth outside, white-silky within. Petals oblong, scarlet, with close parallel veins, 3″ by 1″, obtuse, stellate-tomentose without, glabrescent within. Stamens about 75 in 6 bundles, one of which is central

round the style; filaments somewhat flattened and often forked at the tips, half as long as the petals. Ovary green, glabrous; style longer than the stamens. Fruit ovoid, shortly-peduncled, downy, 4″-5″ long, black when ripe; seeds numerous, ovoid, enclosed in abundance of silky, white cotton.

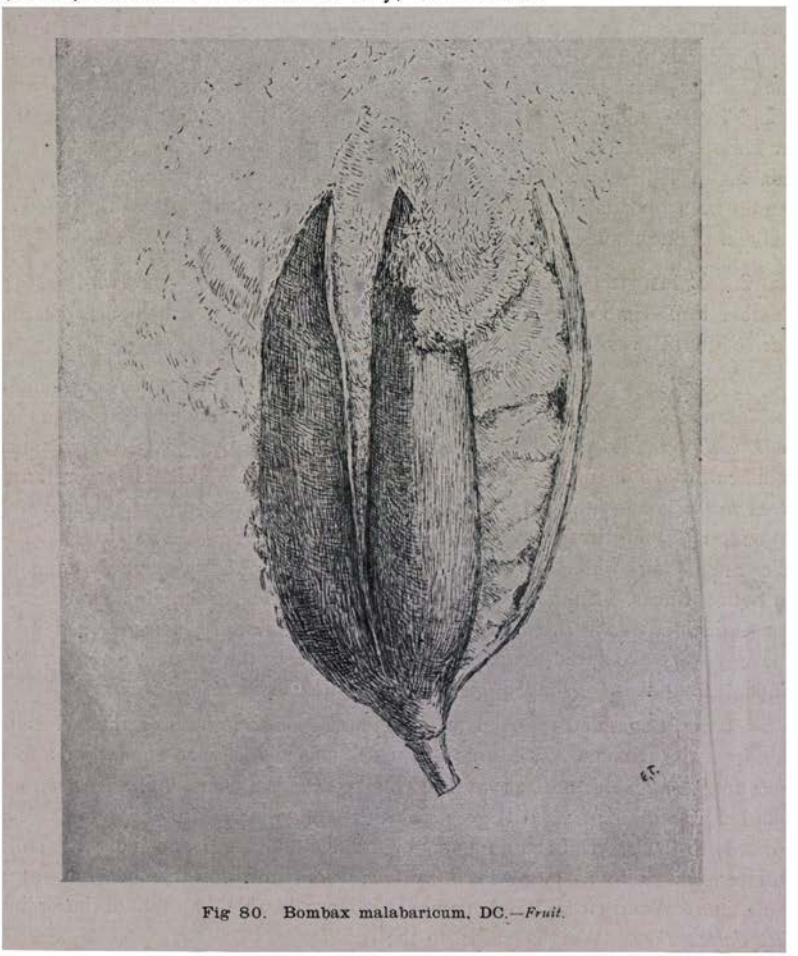


Fig 80. Bombax malabaricum, DC.—*Fruit.*

Throughout the hotter parts of India, Burma and Ceylon, often cultivated. Leafless from Nov. till April. Fl. Feb.-March. Fr. Apl.-May. A very large, buttressed tree with a cylindrical stem, sometimes 100′ to the first branch and 5′-6′ in diameter 5′ from the ground. In exposed situations on the hard trap of the Akrani (Satpuras) at 3700′ altitude, the stems are often stout and short

with the branches shortened and curved upwards at the ends. The tops of many of these trees become umbrella-shaped, principally on account of the dry soil and strong prevailing winds. The bark is covered with conical prickles when the tree is young; afterwards the trunk is without prickles. Bark grey, corky, rather smooth between the deep longitudinal-fissures and cross-cracks. Wood soft, white, turning dark on exposure; no heartwood and without annual-rings; fairly durable under water; decays rapidly on exposure. Used for planking, boxes, tea-boxes, lining of wells, and is in good demand along the coast of Kanara and the Konkan for canoes which are hollowed out of the stems. Weighs about 25 lbs. to the cub. ft. A light-brown gum, *Mocharas* or *semul-gum*, used in native medicine, exudes from wounds in the bark. The silky floss which clothes the seeds of this and the next species is used for stuffing pillows and cushions.

2. B. insigne, Wall. Pl. Asiat. Rar. 1, 71. t. 79, 80; Fl. Br. I. 1, 349; Gamble Ind. Timb. 91; Cooke Fl. Pres. Bomb. 1, 120; sub-species *genuina,* Var. *Wightii*, Prain in Jour. As. Soc. Beng. 62, (1903).

A very large tree; young stems and branches prickly. Leaves long-petioled; petioles as long as or longer than the leaflets; leaflets usually more numerous than in *B. malabaricum*, and with shorter petioles, otherwise the foliage of this species is difficult to distinguish from that of *B. malabaricum.* Flowers larger than in *B. malabaricum*, solitary, on thick club-shaped, prickly peduncles. Calyx ovoid in bud, 1·5″ long, irregularly splitting at the top, prickly at the base, densely silky rufous-hairy within. Petals long, strap-shaped, 5″ by ·5″, densely tomentose on both surfaces. Stamens very numerous, about 400, arranged in bundles but not so distinctly as in *B. malabaricum;* filaments filiform, 3″ long, forked at the apex. Ovary ovoid, red-tomentose; style exceeding the stamens; stigma lobed. Capsule long sausage-shaped, glabrous, otherwise as in *B. malabaricum.*

Burma, Pegu, and the Andamans; common on the ghâts of the W. Peninsula from the Konkan southwards. This tree, which is very similar in appearance to *B. malabaricum,* has at least along the W. Coast hitherto been confounded with the latter. It is gregariously common in N. Kanara from the coast upwards to the crest of the ghâts also in the Konkan and Deccan districts; often on laterite, is quite as large as *B. malabaricum,* and flowers and fruits at the same time. Wood (from the Andamans) is more durable than that of the ordinary *Silk Cotton Tree.* Weighs 31 lbs. to the cub. ft.

8. ERIODENDRON, DC.

Trees, unarmed or prickly. Leaves digitate. Flowers tufted at the ends of the branches or axillary, white or rose-coloured; bracteoles O. Calyx cup-

shaped, truncate or 3-5-fid. Petals oblong. Staminal-bundles 5, connate at base; each bearing 2-3, sinuous or linear anthers. Ovary 5-celled; style cylindrical, dilated; stigma obscurely 5-lobed; ovules many in each cell. Capsule 5-valved, silky within. Seeds covered with abundant silky hairs; albumen scanty; cotyledons much contorted.

E. anfractuosum, DC. Prodr. 1, 479; Fl. Br. I. 1, 350; Dalz: & Gibs. Bomb. Fl. 22; Bedd. Fl. Sylv. 30; Gamble Ind. Timb. 91. *White Silk Cotton Tree. Shameula, katsavar*, Vern.

Fig 81. Eriodendron anfractuosum, DC.

A tall tree, prickly when young, branches horizontal, verticellate. Leaves deciduous, long-petioled; leaflets 5-8, lanceolate-cuspidate, entire or serrulate at the apex, glaucous beneath, shortly petioluled; blade 3″-4″ by 1″; petioles as long as or longer than the leaflets; stipules small, caducous. Calyx ·75″ long, cup-shaped, 5-cleft, leathery. Petals 5, oblong, thick, whitish, imbricate, 3-4 times

as long as the calyx, villous outside, glabrous within. Stamens in 5 bundles, shorter than the petals; 3 sinuous anthers in each bundle; pollen abundant, golden-yellow. Ovary conical, glabrous; style stout, exceeding the stamens; stigma obscurely 5-lobed. Capsule ovoid, oblong, 5″-8″ by 2″, 5-valved, many-seeded; seeds enclosed in separate woolly balls.

S. America and W. Indies. Forests of the hotter parts of India and Ceylon. Rare in forests of the Bombay Presidency, probably indigenous in Khandesh, planted in the Konkan, Guzerat, N. Kanara, Poona, etc., also about villages and temples in the Madras Presidency. Timber soft and useless. The silky-floss around the seeds will probably turn out to be a valuable product *(Kapok floss)*. Fl. Dec.-Jan. Fr. Mch.-Apl.

Order XVII.—STERCULIACEÆ.

Trees or shrubs, more or less stellate-hairy. Leaves stipulate, alternate, simple or digitate. Inflorescence usually axillary and cymose. Flowers regular, uni-sexual or hermaphrodite. Sepals 5, more or less connate. Petals 5, free or connate at the base or O. Stamens monadelphous, indefinite or definite, or free and definite, with or without alternating staminodes; anthers 2-celled; pollen smooth. Ovary free, 2-5-celled, rarely only 1 carpel; ovules few or many, attached to the inner angles of the carpels; styles as many as ovary-cells, free or united; stigmas free, spreading. Fruit dry or fleshy, dehiscent or indehiscent; seeds rarely arillate, with or without albumen; cotyledons leafy, flat, folded or convolute. The *Sterculiaceæ* are closely allied to the *Malvaceæ* and *Tiliaceæ*.

Flowers unisexual or polygamous. Petals O. Anthers 2-celled in a ring at the top of the staminal-column. (*Sterculieæ*).	
Anthers numerous. Fruit dehiscent, not keeled.	1. Sterculia.
Anthers 5. Fruit indehiscent, keeled... ...	2. Heritiera.
Flowers bisexual. Petals 5. Staminal-column dilated above into a cup, on the edges of which are the anthers, alternating with staminodia. (*Helictereæ*).	
Capsule membranous; inflated	3. Kleinhovia.
Capsule woody, not inflated.	
Fruit of 5 spirally-twisted carpels	4. Helicteres.
Fruit a loculicidally 5-valved capsule	5. Pterospermum.
Flowers bisexual. Petals 5, Staminal-column tubular, antheriferous for nearly its whole length; no staminodes (*Eriolæneæ*)	6. Eriolæna.

1. STERCULIA, Linn.

Trees. Leaves simple, palmately-lobed or digitate, often tomentose with stellate hairs. Flowers uni-sexual or polygamous usually paniculate. Calyx tubular, 4-5-lobed or cleft, often coloured. Petals O. Staminal-column with 20-30 anthers in a ring at the apex or arranged without order. Ovary of 4-5, sessile or stalked carpels; ovules 2 or more in each; styles connate at the base; stigmas free, spreading. Follicles sessile or stalked, woody or membranous; seeds 1 or numerous, albuminous, rarely winged; albumen bipartite, flat or folded;

cotyledons flat, thin, adhering to the albumen or thick and fleshy.

Follicles woody. Seeds not winged.
- Leaves digitate. Leaflets 7-9 ... . 1. S. fœtida.
- Leaves palmately lobed.
  - Carpels bristly ... ... 2. S. urens.
  - Carpels rusty-villous ... ... 3. S. villosa.
- Leaves simple, 1-nerved ... ... 4. S. guttata.

Follicles membranous; seeds not winged ... ... 5. S. colorata.

Follicles large, woody; seeds winged ... ... 6. S. alata.

1. S. fœtida, Linn. DC. Prodr. 1. 483; Fl. Br. I. 1. 354; Bedd. Fl. Sylv. 31; Dalz. & Gibs. Bomb. Suppl. 10; Grah. Cat. Bomb. Pl. 18; Cooke Fl. Pres. Bomb. 1, 123; Gamble Ind. Timb. 93. *Jangly badam; Bastard Poon Tree. Kua-mhud, virhoi, goldaru, nagalkuda,* Vern.

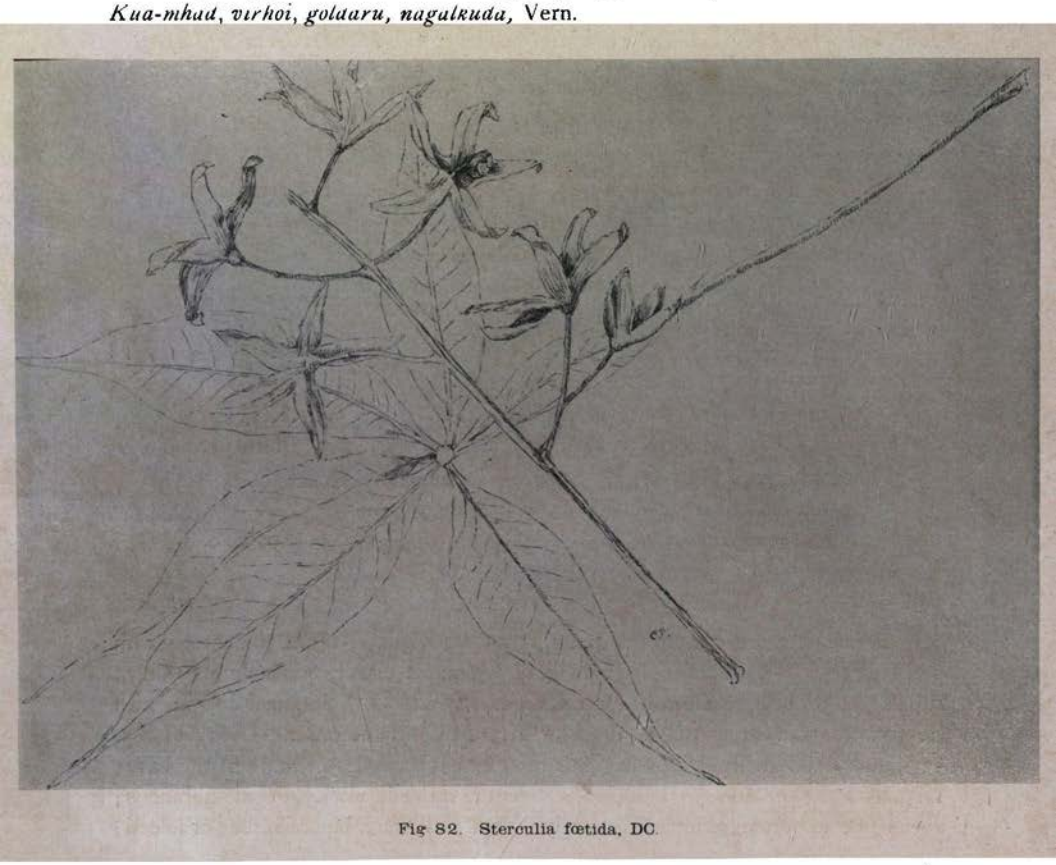


Fig 82. Sterculia fœtida, DC.

A large tree. Leaves digitate, crowded at the ends of the branches; leaflets 7-9, subsessile, elliptic-lanceolate, long-acuminate, glabrous except when very young, about 6″ long by 2″ broad; petioles 6″-9″ long; stipules caducous. Flowers 1″-1·5″ in diameter, dull-red, fœtid, in many-flowered, erect, racemose panicles 6″-8″ long. Calyx-segments lanceolate, villous within, glabrous on the outside, ·5″ long. Male fl.: Staminal-column ·4″ long, slender, curved, hairy at the base and with 10-15 anthers. Fem. fl.: Ovary of 5 villous carpels, on a stout gynophore ·25″ long, with a ring of subsessile staminodes. Follicles 1-5, large, woody, 4″-5″ long, boat-shaped, fibrous within; seeds numerous, black, smooth, exalbuminous.

Southern India, Malabar, Ceylon; cultivated in gardens near the city of Bombay but doubtfully indigenous in the Bombay Presidency. A large tree with horizontally-whorled branches, covered with the broad-ovate, horizontal scars of the fallen leaf-petioles. Bark thick, white, flakey. Wood light-yellowish, tough, warps and splits. Seeds edible. Exudes a gum resembling tragacanth, Watt. Fl. Apl.-May. Fr. C. S. The flowers have a remarkably disgusting odour.

2. S. urens, Roxb. Fl. Ind. 3, 145; Fl. Br. I. 1, 355; Dalz. & Gibs. Bomb. Fl. 231; Bedd. Fl. Sylv. 32; Brandis For. Fl. 33; Gamble Ind. Timb. 94; Cooke Fl. Pres. Bomb. 1, 124; *Karai, kandol, saldawar*, M.; *Kurda, kalauri*, Vern; *Kud* in the Satpudas of Khandesh; *Karai, kada*, Guz.

A middle-sized tree with white bark. Leaves at the ends of the branches palmately sinuately, 5-lobed, cordate, villous beneath; lobes entire, acuminate, with shallow sinuses; blade 7″-8″ across; petioles 6″-10″ long. Flowers ·25″-·40″ across, glandular-pubescent, in dense panicles at the ends of the branches when the tree is leafless, consisting of yellow, male and female or hermaphrodite flowers mixed; pedicels short; bracts linear, deciduous. Calyx about ·25″ long, campanulate; lobes acute, spreading, with a small hairy gland at the base of each. Male fl.: Filaments 10, alternately long and short. Hermaph. fl.: Carpels usually 5, on a short gynophore; style short, hairy; stigmas 5.

Fig 83. Sterculia urens, Roxb.—*Fruit.*

Stamens in a ring round the carpels. Follicles 5, sessile, coriaceous, red, covered with stinging bristles; seeds oblong, black or dark-brown, 3-6 in each carpel.

Tropical Himalayas from the Ganges eastwards, E. and W. Peninsulas, Southern India and Burmah, Ceylon. In the Deccan districts in dry deciduous forests. Often associated with *Boswellia* and other xerophites in the Khandesh Satpudas, where it is a conspicuous tree at all times and presents a weird appearance when without leaves during the cold weather. It is also found near the coast on rocky soil (not on laterite) in the Konkan and North Kanara. Fl. Jan. Fr. Apl.-May. A moderate-sized tree, usually with an irregular, gnarled, short trunk. Bark smooth, shining, thick, greenish-white; the thin papery rhytidome scaling off like birch bark. Wood very soft, reddish-brown, with an unpleasant smell. Pores large, oval, filled with gum. Medullary rays broad, crossed by alternate lines of light and dark tissue. Weighs about 40 lbs. to the cub. ft. Used for toys and musical instruments. A white gum exudes from the bark *(katila gum)*, which is employed medicinally by the natives as a substitute for *gum tragacanth.* The seeds are roasted and eaten by the Gonds and Kurkas of the Central Provinces. A good fibre is obtained from the inner bark. The flowers and shoots of this species have the usual fœtid odour of the genus.

3. S. villosa, Roxb. Fl. Ind. 3, 153; Fl. Br. I. 1, 355; Brandis For. Fl. 32; Dalz. & Gibs. Bomb. Fl. 22; Gamble Ind. Timb. 94; Cooke Fl. Pres. Bomb. 1, 124. *Sarda, sarde*, M.; *Savaya, chauri*, K.

A small or middle-sized tree. Leaves large, crowded at the ends of the branches, base cordate, 5-7, deeply palmately-lobed; lobes entire or in young leaves irregularly sublobate with cuspidate divisions, tomentose beneath, glabrescent above; blade 12″-15″ across; petioles as long as the blade; stipules large, broad, lanceolate, deciduous. Flowers ·6″ across, pedicelled, yellow, in terminal, deflexed, rusty-pubescent panicles, crowded at the ends of the branches. Male and hermaphrodite flowers mixed, the former much more numerous; bracts filiform, caducous. Calyx campanulate, 5-lobed, rusty stellate-hairy outside, membranous, pink inside at the base. Male fl.: Anthers 10, recurved, on a glabrous, staminal-column ·2″ long. Hermaph. fl.: Ovary globose on a short, ·1″ long, cylindrical, glabrous gynophore, surrounded at the base by 10 anthers inserted on a ring which is adnate to the gynophore; style hairy, recurved. Follicles 2-7, coriaceous, oblong, sessile, rough, brown, stellate-tomentose within and without, about 2″ long; seeds black; albumen bipartite; cotyledons thin.

Tropical Himalaya, ascending to 3,500′; N. W. India; Bengal; Andaman and Cocos islands; W. Peninsula from Guzerat southwards to N. Kanara and Malabar. Fl. Dec.-Jany. Fr. H. & R. S. Usually a small or moderate-sized, deciduous tree sparsely distributed in dry, deciduous forests; bare of foliage during

the hot season. Bark grey-brown, smooth, covered with corky warts; bast very tough. Wood grey, soft, very light and spongy. Annual-rings more or less distinct and marked by a line of large pores; the remaining pores are large, subdivided and sparsely distributed outside the ring of spring wood. Medullary rays broad, firmer than the bands of tissue between them, joined by transverse bars of darker tissue. Bark yields a valuable but coarse fibre used for elephant breast-band and timber-dragging ropes; also for sacks and coarse bags in S. India. A pellucid gum exudes from scars in the bark.

4. S. guttata, Roxb. Fl. Ind. 3, 148; Fl. Br. I. 1, 355; Bedd. Fl. Sylv. t. 105; Dalz. & Gibs. Bomb. Fl. 23; Gamble Ind. Timb. 95; Cooke Fl. Pres. Bomb. 1, 124. *Kookur, goldar, koketi, chakro,* M.; *Happu savaga,* K.

Fig 84. Sterculia guttata, Roxb.

A large tree. Leaves simple, ovate or oblong, acute or acuminate, slightly cordate or rounded at the base, glabrous above, stellate velvetty-tomentose

beneath; blade 5″-8″ by 3″-4·5″, petioles 1·5″-2·5″ long, thickened at the tip; lateral-nerves about 8 pairs, the lowest pair basal, with prominent reticulate nervation beneath. Flowers ·75″ across, yellow-purple with a fœtid smell, bracteate at the base, in terminal or axillary racemes, crowded at the ends of the branches. Male and hermaphrodite flowers mixed, usually with unequal pedicels and fascicled 3 together along the rachis. Calyx densely rusty-villous outside, glandular-hairy within, campanulate, 5-fid, ·3″ across; segments oblong, acute, ultimately reflexed. Male fl.: Anthers 10-12 on a reflexed, glabrous, slender, staminal-column, ·25″ long. Hermaph. fl.: Ovary globose, 3-5-lobed, stellate-hairy, stout, glabrous on a stalked ·25″ long gynophore. Follicles 1-5, woody, obovoid, 3″ long, bright-red or scarlet, stellately-villous without, yellow-pink or scarlet and glabrous shining within; seeds ovoid, black, albuminous; funicles covered with yellow, stinging hairs; albumen amygdaloid; cotyledons elliptic.

Ghâts of the W. Peninsula from the Konkan to Malabar; E. Peninsula, Malacca and the Andamans; Ceylon. Throughout the forests of the Konkan and North Kanara, usually in or near tropical rain-forests. A large, buttressed tree with cracked, ash-coloured bark. Wood grey, soft, light and porous with broad medullary rays and a distinct silver-grain; transverse-bars not prominent. New flowers and ripe fruit about Jan. and Feb. Bare of leaves from Jan. to May. Bark yields a strong fibre, adapted for cordage and the manufacture of paper.

5. S. colorata, Roxb. Fl. Ind. III, 146; Fl. Br. I. 1, 350; Bedd. Fl. Sylv. 32; Dalz. & Gibs. Bomb. Fl. 23; Gamble Ind. Timb. 96; Cooke Fl. Pres. Bomb. 1, 125. *Kowsey*, M.; *Bharikoi, khavas, khanshi*, Vern.

A large tree. Leaves crowded at the ends of the branches, usually palmately 3-lobed, cordate; lobes triangular-acuminate, glabrescent; blade 4″-8″ by 5″-9″; petioles 4″-12″ long; 3-5 main basal-nerves; stipules lanceolate, erect. Flowers in numerous short, terminal panicles, covered with bright orange-red, resinous, stellate-pubescence. Calyx ·75″-1·5″ long, widening gradually upwards; lobes ·1″ long, broadly-triangular, valvate, with a green glandular surface at the base of the pink tube inside which is surmounted by a ring of hairs; pedicels ·25″ long, articulate with the calyx-tube. Male fl.: Staminal-column red, 1″-1·25″ long, exserted; anthers yellow, 10-30, sessile at top of column; cells linear, unequal. Hermaph. fl.: Anthers about 30, aggregated and sessile on a long gynophore just beneath the ovaries; styles short, recurved. Fruit of 1-5, lanceolate, membranous glabrous, stipitate carpels, 2″-3″ long. The follicles open out long before the seeds ripen; valves pink outside, yellowish inside; seeds usually 2, adhering 1 to each margin of the carpel, yellow, wrinkled, or smooth, size of a small bean.

Forests of E. Bengal, W. Peninsula, Burma, Andamans and Ceylon; throughout the Presidency in deciduous forests, ascends to 3700′ in the Satpuras

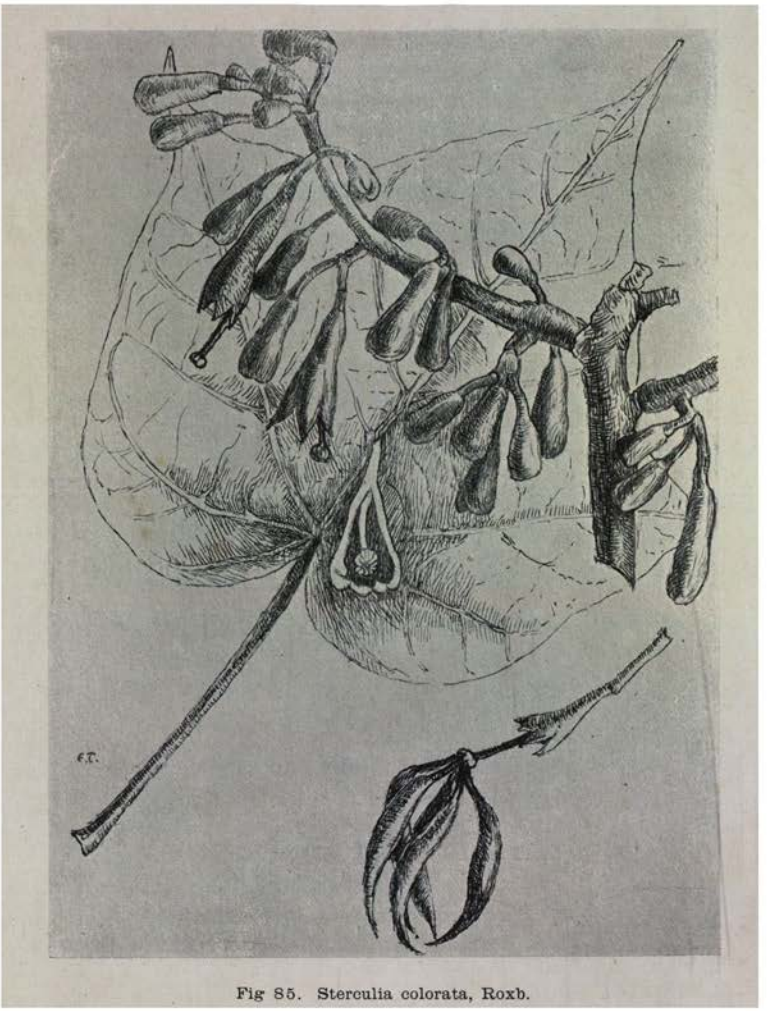


Fig 85. Sterculia colorata, Roxb.

(Akrani) but is now here abundant. Fl. March-May. Fr. May-June. Bark grey scaly, thick; inner bark mottled-white. Wood soft, whitish with concentric bands of lighter tissue. Medullary rays broad, wavy. Bark yields a fibre. The brown, shining, glabrous follicles open about the end of April. The bottom of the calyx-tube is often filled with watery matter. The new leaves appear in May.

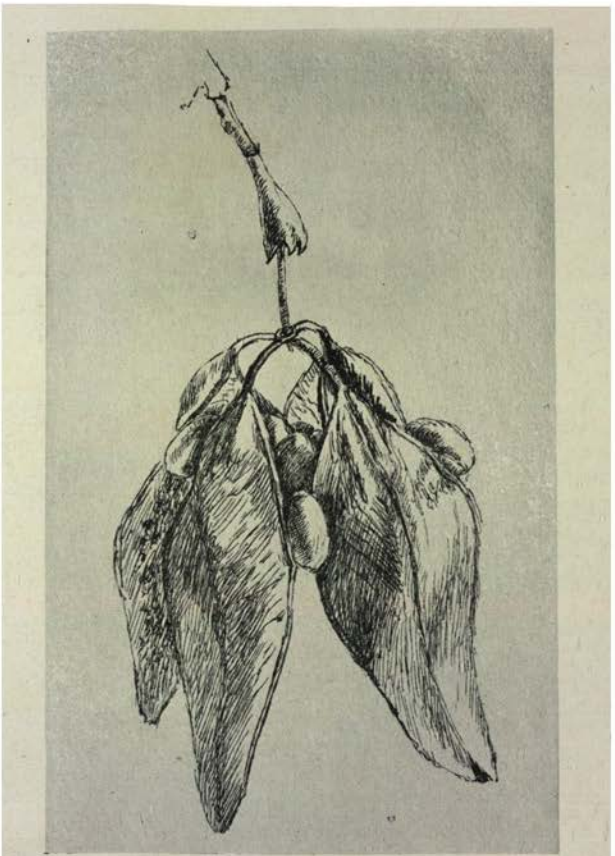


Fig 86. Sterculia colorata, Roxb.—*Fruit.*

6. S. alata, Roxb. Fl. Ind. 3, 152; Fl. Br. I. 1, 360; Gamble Ind. Timb. 96; Cooke Fl. Pres. Bomb. 1, 125. *S. Haynii.* Bedd. Fl. Sylv. t. 230. *Tattele* or *Talbe mara*, K.

A very large tree with a straight cylindrical trunk; young parts golden stellately-pubescent. Leaves clustered near the ends of the branches, ovate, acute, cordate, glabrous, nearly membranous or sub-coriaceous; blade 4″-12″ by 3″-7·5″; basal-nerves 5, strong beneath; lateral-nerves 1-2 pairs; petioles 1·5″-4″ long; stipules very small, subulate. Flowers tomentose, in axillary, short-pedicelled, bracteate, few-flowered, panicled racemes. Calyx ·75″ long, deeply divided, ferruginous-tomentose outside; segments 5-6, thick, fleshy, linear-lanceolate.

Male fl.: Staminal-column slender, ·5″ long; anthers about 20 in 4-5 bundles; cells linear, flexuose; sterile ovaries 5-6, sessile. Fem. or Hermaph. fl.: Ovaries 5, sessile, pubescent; styles pilose, recurved; ovules numerous. Follicles large, woody, obliquely-globose, 3″-5″ in diameter; top flattened, pointed at the end of the commisure. Seeds 2″ long by ·75″ broad, in 2 rows, about 40, tipped with a broad, spongy wing, thin at the top margin; albumen wax-like.

Silhet and Chittagong; W. Peninsula from N. Kanara southwards. In N. Kanara I have found it in evergreen rain-forests near Burboli at the base of the ghâts on the Kalanadi, also near Sonda in the Sircy taluka at about 2000′ altitude. This tree, notwithstanding its seeds, admirably suited for dispersion by

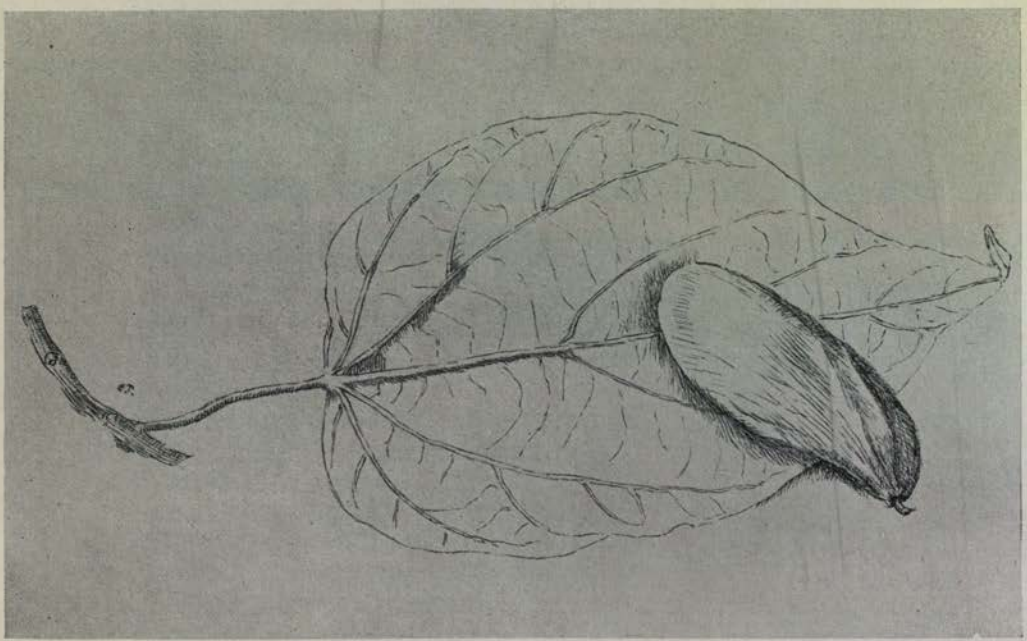


Fig 87. Sterculia alata, Roxb.—*Leaf and seed.*

water, is not common in the N. Kanara evergreen forests. Dalzell mentions two trees planted in the garden near Hewra from seed obtained in N. Kanara, at Koorsullee on the Kalanadi, Bo. Fl. Suppl. 10. There are also in the Empress and College of Science gardens at Poona fine growing specimens probably also raised

from Kanara seed. Fl. Feb.-March. Fr. ripe C. S. Some of the trees near Sonda were over 100′ high to the first branch by 4′ in diameter at the base. Bark smooth, grey. Wood light, fibrous, dark-grey with black lines on a cross section. Pores moderate-sized, scattered and filled with a black substance. Medullary rays moderately-broad, short, joined by distinct, close, continuous lines of light-coloured tissue. Weighs 39 lbs. to the cub. ft. Seeds eaten in Burma.

2. HERITIERA, Ait.

Trees. Leaves coriaceous, simple, silvery-scaly beneath. Flowers small, unisexual, in axillary panicles. Calyx 4-7-cleft. Petals O. Male fl.: Staminal-column

Fig 88. Heritiera littoralis, Dryand.—*Fruit.*

slender, bearing a single ring of 4-5 anthers at the top. Male fl.: Ovary; carpels 5; style short; stigmas 5, thick; 1 ovule in each cell. Fruit woody, indehiscent, keeled or winged on the back; seeds exalbuminous; cotyledons thick.

H. littoralis, Dryand. in DC. Prodr. 1, 484; Fl. Br. I. 1, 363; Dalz. & Gibs. Bomb. Fl. 22; Bedd. Fl. Sylv. 33; Gamble Ind. Timb. 98; Cooke Fl. Pres. Bomb. 126. *Looking-glass Tree. Sundrichand, koleand*, M. *Chandmara,* K.

A moderate-sized tree. Leaves evergreen, coriaceous, ovate, obtuse or bluntly acuminate, base rounded, glabrous, shining above, white or reddish silvery-scaly beneath; blade 5″-8″ by 2″-4″; petioles ·5″ long. Flowers small, dull orange-coloured, numerous, in loose, tomentose panicles shorter than the leaves. Calyx urceolate, 6-toothed. Male fl.: Staminal-column short; anthers 5, sessile. Female flower larger than the male. Calyx bell-shaped, tawny-tomentose, acutely 5-toothed. Gynophore shorter than the calyx. Carpels 5-2, sessile, ovoid, usually smooth, woody, 1″-4″ long, with a strong sharp keel along the outer edge.

Tropical coasts of the old world; along the coasts and tidal rivers of the E. & W. Peninsulas, Burma and the Andamans, not in the Sundarbans; along the banks of the Kalanadi and near the coast of North Kanara at Karwar, but nowhere abundant. Fl. R. S. Fr. Jan.; remains long on tree. Bark grey, furrowed. Heartwood dark-red, very hard and close-grained. Pores moderate-sized, often divided and sometimes filled with a white substance. Medullary rays uniform, moderately broad, distant; cross-bars faint. Weighs about 65 lbs. to the cub. ft. The bark contains tannin. The wood does not appear to be in demand for any special purpose in N. Kanara. The roots do not apparently develop pneumatophores like *H. minor*, the Sundarbans species.

3. KLEINHOVIA, Linn.

A medium-sized tree. Leaves entire, 3-7-palminerved. Inflorescence in large, terminal panicles. Sepals 5, deciduous. Petals 5, unequal; upper with longer claws; margins involute. Staminal-column elongate, dilated into a 5-fid cup; divisions each with 3 extrorse, 2-celled anthers; cells divergent. Ovary 5-celled and lobed, inserted in the staminal-cup; style slender; stigma 5-fid. Capsule membranous, inflated, loculicidally 5-valved. Seeds tubercled; albumen scanty or O; cotyledons convolute; radicle next the hilum.

K. Hospita, Linn.; DC. Prodr. 1, 488; Fl. Br. I. 1, 364; Dalz. & Gibs. Bomb. Fl. 23; Bedd. Fl. Sylv. 33.

Southern Konkan, Nimmo (ex Graham l. c.). "A doubtful native" Dalz. An ornamental handsome species. Flowers in the rainy season. Planted throughout the Presidency.

4. HELICTERES, LINN.

Trees or shrubs. Leaves simple. Flowers axillary, solitary or fascicled. Calyx tubular, 5-fid, often oblique. Petals 5, clawed, equal or unequal; claws elongated, red, fading to a lead-colour. Staminal-column adnate to the gynophore. Anthers 5-10; cells divaricating, often confluent into one. Ovary 5-lobed, 5-celled; cells several-ovuled; styles 5, subulate, more or less connate. Carpels dehiscent, spirally twisted, opening along their inner edge. Seeds many; albumen scanty; cotyledons folded round the radicle.

H. Isora, Linn.; Roxb. Fl. Ind. 3, 143; Fl. Br. I. 1, 365; Dalz. & Gibs. Bomb. Fl. 22; Bedd. Fl. Sylv. 33; Brandis For. Fl. 34; Cooke Fl. Pres. Bomb. 1, 128; Gamble Ind. Timb. 99. *Kevani, muradsing*, M.; *Kavargi, kempu-kowri,* K.; *Murrori-ka-jhar*, H.; *East Indian Screw Tree.*

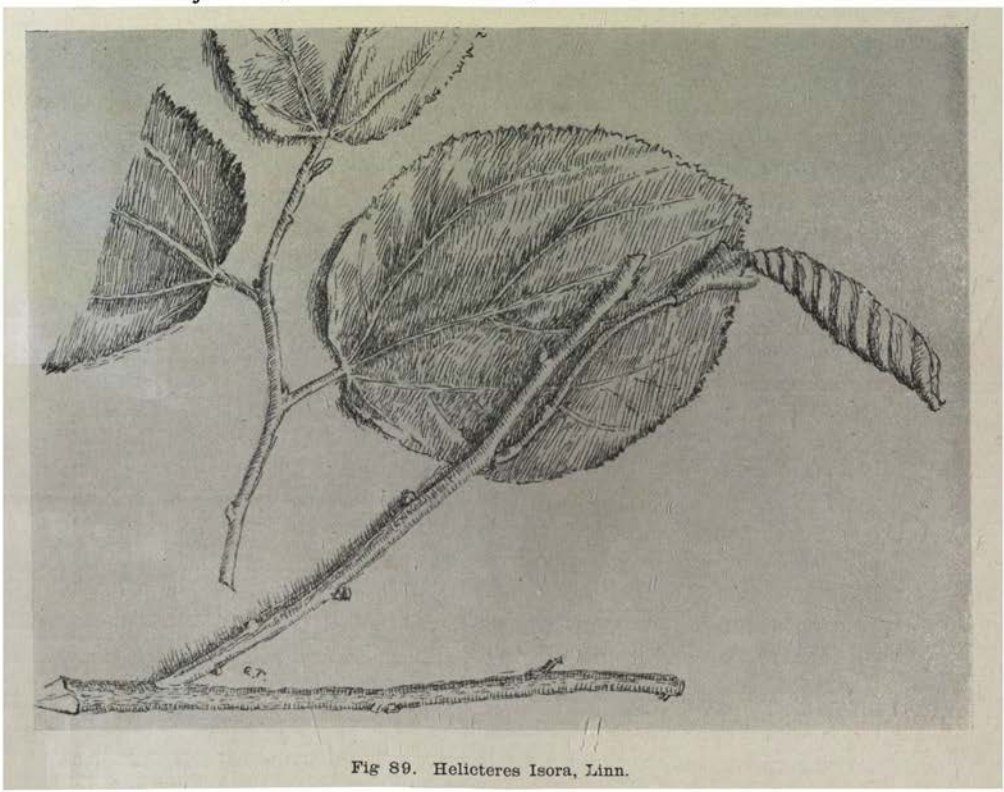


Fig 89. Helicteres Isora, Linn.

A large shrub, covered with rough, stellate tomentum. Leaves bifarious, obovate or orbicular, obliquely cordate, irregularly toothed, shortly acuminate,

scabrous above, pubescent beneath; blade 3″-5″ by 2″-4″; petioles ·5″ long. Flowers 2-6 together, in short, few-flowered, axillary cymes. Calyx ·5″-1″ long, laterally compressed, bilabiate, obliquely 5-toothed, brown stellately-pubescent outside. Petals exserted, red, 2 broader than the others and closely reflexed on the calyx-tube. Staminal-column adnate to the gynophore, 1·5″ long, exerted, deflexed at tip; anthers 10, on short filaments in a ring round the ovary. Fruit 1·5″-1″ long, consisting of a cylinder of 6, beaked, tomentose, spirally-twisted follicles. Seeds with leafy cotyledons. The petals change colour from red to leaden-blue when the flowers are attacked by insects.

Bengal, S. and Central India, Western Peninsula, Burma and Ceylon; throughout the forests of the presidency; abundant in the undergrowth of many North Kanara ghát forests. Fl. Aug.-Dec. Fr. ripe March. Wood light-grey, smooth, rather soft. Pores numerous, small, in groups or lines. Medullary rays fine and very fine, wavy. Weighs about 40 lbs. to the cub. ft.

The inner bark yields a strong white or greenish fibre with a beautiful pearly lustre. This is extracted in the Northern and Central districts of Travancore and woven into sacks and in the Southern districts of that country it is used in the manufacture of parti-coloured canvas, locally called "Viries." There is a brisk local demand in Travancore for both the canvas and sacks which latter are used for carrying rice, areca nuts and other produce. The chief and most valuable characteristic of *Helicteres* fibre is that it does not decay when exposed to damp. Like jute it becomes brown with age but does not deteriorate so quickly; it is also stronger and more lasting.

The twisted fruits are used in native medicine in combination with other drugs in the treatment of gastric and intestinal disorders. Their therapeutic value has not yet been investigated by European doctors.

5. PTEROSPERMUM, SCHREB.

Trees or shrubs, scaly or stellately-tomentose. Leaves leathery, oblique, simple or lobed. Flowers axillary, on 1-3-flowered peduncles; bracteoles usually 3, entire or laciniate, persistent or caducous. Sepals and petals 5 each, deciduous. Staminal-column short, adnate to the gynophore. Filamented-anthers in threes between each pair of 5 ligulate-staminodes; cells parallel; connective apiculate. Ovary sessile on the top of the column, 5-celled; cells each with many ovules; style entire; stigma 5-furrowed. Capsule woody or coriaceous, loculicidally 5-valved. Seeds winged; albumen thin or O; cotyledons wrinkled or folded; radicle inferior.

Bracteoles linear, entire, caducous.

Flowers 1·25″ across ... ... 1. P. suberifolium.

Bracteoles laciniate or palmately-lobed, caducous.
Flowers very large, 5″ across ... ... 2. P. acerifolium.

Bracteoles pinnatisect or deeply gashed; segments linear, persistent.
Flowers 2″ in diameter ... ... 3. P. Heyneanum.

1. P. suberifolium, Lam. Tab. Encyc. et Method. 3, 136, t. 576, f. 2; Fl. Br. I. 1, 367; Dalz. & Gibs. Bomb. Fl. 24; Bedd. Fl. Sylv. 34. *Muchucuda.* Vern.

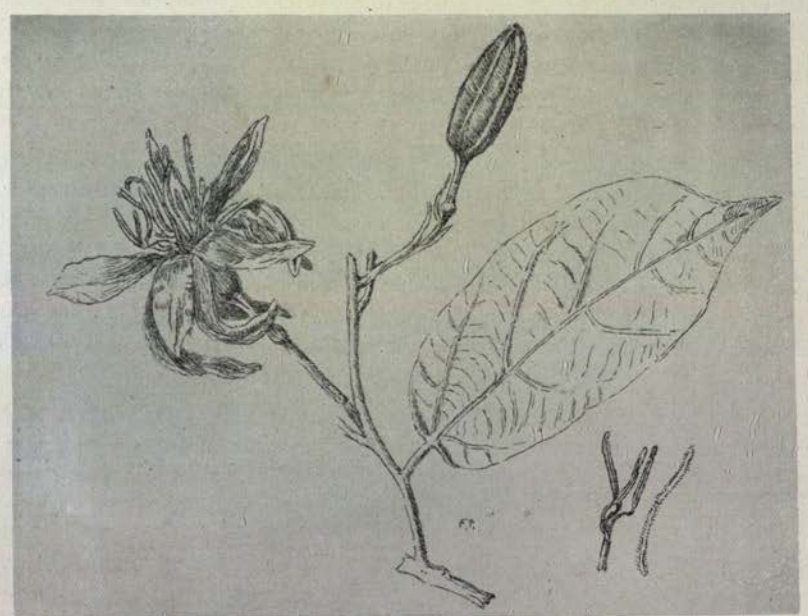


Fig 90. Pterospermum suberifolium, Lam.

A small tree. Leaves coriaceous, cuneate-oblong, obliquely rounded or cordate at the base, sometimes irregularly toothed or somewhat lobed near the apex, acuminate, glabrous above, white or creamy pubescent beneath; blade 2·5″-4″ by 1″-1·50″; stipules subulate, caducous; petioles ·25″ long. Flower-buds ·5″-1″ long, ovoid-obtuse, with 5 strong, longitudinal ribs; lateral and basal-nerves stellate-hairy. Flowers 1·5″-2″ across, white, fragrant, axillary on jointed stellate-hairy, bracteate pedicels; bracts linear, 3-divided, distant from the flower and situated below the articulation of the peduncle with the thick flower-stalk,

caducous; peduncles ·25″-1″ long. Sepals linear, revolute, stellately-tomentose without, hairy within. Stamens; filaments united in threes, free for half their length; anthers ·30″ long, linear, 2-celled, often marginal; connective red, apiculate. Petals linear-oblong, obtuse, slightly shorter than the sepals, red, minutely warted, sparsely covered with white, short hairs. Staminodes as long as the stamens, filiform. Ovary densely villous; cells 4-ovuled. Capsule ovoid or obovoid, acute, densely furfuraceous-pubescent on the outside, 1″-2″, long, sub-angular. Seeds usually 2 in each cell.

W. Peninsula, Madras, Cuddapah, N. Arcot, Godavery forests, Madura and in Ceylon; often planted. It is stated to occur in the "Konkans" by Nimmo, Grah. Cat. Bo. Pl. 19, and to be called *Muchucuda* in the vernacular. Dalzell apparently follows Graham, as he simply says "Concans" and quotes the name "*Muchucuda.*" Bomb. Fl. 24. I do not know whether there are authentic specimens from the Bombay Konkan collected by either Nimmo or Dalzell. In the first edition of my list of Bombay Trees etc., I stated that it was found in the evergreen forests of the N. Kanara ghâts. There is a *Pterospermum* common on the southern ghâts which I have not found in flower and which might possibly be this species but equally answers to the description of *P. Heyneanum,* as far as the leaves are concerned. Wood-light red, tough; used in the Madras presidency for carts and building purposes.

2. P. acerifolium, Willd.; DC. Prodr. 1, 500; Bedd. Fl. Sylv. 35; Brandis For. Fl. 35. *Karm-kara, kanak-champa, karnikar,* Vern.

A large tree with smooth, ash-coloured bark. Leaves obovate, polymorphous, cordate or peltate, coarsely toothed, palmately nerved, glabrous above, white-tomentose beneath; blade 10″-14″ by 6″-12″; petioles ·5″ long, stout. Flowers axillary, very large, and fragrant. Sepals linear, brown-tomentose without, paler within, 6″ by ·5″. Petals white, shorter than the sepals. Staminodes club-shaped, stouter and longer than the filamented-anthers. Staminal-column glabrous, 1·5″ long, filaments slender. Gynophore longer than the staminal-column. Ovary 5-angled, densely brown-tomentose; style long, stout with a club-shaped stigma; ovarian-cells many-ovuled. Capsule 4″-6″ long, 5-angled; 5-celled. Seeds numerous, winged; albumen mucilaginous, scanty; cotyledons thin, folded.

Sub-Himalayan region from the Jumna to Bengal, Chittagong, Tenasserim, the Konkan and Burma, often planted for ornament; on the southern ghâts of North Kanara in evergreen rain-forests, abundant in the Devimone forests. Fl. C. S. Fruit remains long on tree. Bark thin, grey, smooth. Wood light-red, firm, or soft. Pores scanty, oval. Medullary rays, fine, numerous, undulating. Innumerable fine transverse lines cross the rays. Weighs about 47 lbs. to the cub. ft. Leaves used for plates and packing tobacco in Bengal.

3. P. Heyneanum, Wall. Cat. 1169; Fl. Br. I. 1, 369; Bedd. Fl. Sylv. 94; *P. Lawianum,* Nimmo; Dalz. & Gibs. Bomb. Fl. 24; *P. reticulatum,* W. & A. Prodr. 1, 69; Fl. Br. I. 1, 369; Bedd. Fl. Sylv. 34. *Kesali, oopin,* K.

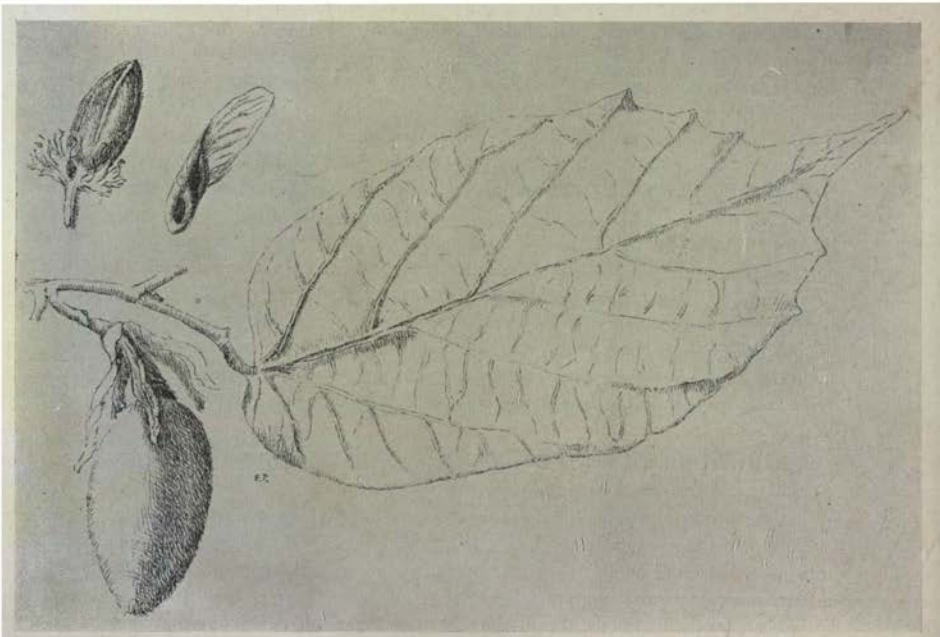


Fig 91. Pterospermum Heyneanum, Wall.

A large tree with dense, rusty-stellate pubescence. Leaves cuneate, oblong, obliquely cordate, entire or acute at the base, irregularly sinuately toothed or lobed at the apex, acuminate, thinly coriaceous, glabrous, pale, shining above; pale yellow, pubescent-tomentose beneath; blade 6″-2·5″ by 3″-1·25″; stipules pinnatisect; petioles ·5″ long. Flowers white, fragrant, about 2″ across; bracteoles pinnatisect from a broad base, imbricate, persistent, tomentose; flower-buds angular, obtusely 5-ribbed at tip, ovoid, tomentose. Sepals linear, silky-hairy within, tomentose without. Petals obovate, white. Staminodes 5, filiform, clavate, hairy, punctate and minutely warted. Stamens ·75″ long; anthers with a long produced connective. Capsule cylindrical, obtusely angled or ovoid, with an acute tip, 2″ long, by 1·2″ in diameter, rough, dark, furfuraceously-

pubescent, 5-valved; peduncle 1″ long, thickened upwards; Seeds unequal, 4-10 in each cell with membranous, falcate wings.

Apparently endemic in the Western Peninsula from the Konkan southwards in moist, evergreen rain-forests along the ghâts, abundant in North Kanara in the Sirsi and Siddapore talukas. Flowers during April and May. Fruit Nov.-Jan. A large or small tree, sometimes attains a height of 100′, with a diameter of 3′. Bark rough, lenticellate, coloured red within. Leaves on young shoots, and particularly on sucker shoots, are remarkably polymorphous, thin, very white beneath, deeply lobed, irregularly toothed and mostly peltate; they are very distinct from those of the parent stem. Wood reddish. Pores moderate-sized, grouped in lines of twos or threes. Medullary rays short, fine, numerous. Weighs about 30 lbs. to the cub. ft. Annual-rings not distinct.

6. ERIOLÆNA, DC.

Trees. Leaves simple or lobed, cordate, crenate or serrate, downy or stellately-tomentose beneath. Flowers rather large, on axillary few-flowered peduncles; buds ribbed at tip; bracteoles 3-5, often laciniate. Calyx at first spathaceous, ultimately deeply 5-cleft. Petals 5, deciduous, flat with broad, tomentose claws. Staminal-column with numerous stamens, all fertile, monadelphous, in many rows; the outer gradually shorter; staminodes 0. Ovary sessile, 5-10-celled; style 1; stigma with 10, revolute lobes. Capsule woody, 5-10-celled loculicidal. Seeds numerous in each cell, winged above; albumen thin; cotyledons much contorted or plaited; radicle next the hilum.

E. Candollei, Wall. Pl. As. Rar. 1, 51, t. 64; Cat. 1175; Fl. Br. I. 1, 370; Dalz. & Gibs. Bomb. Fl. 24; *E. Stocksii*, H. f. & T. Mss.? Fl. Br. I, 1, 370; *E. Hookeriana,* W. & A. Prodr. 70.? Bedd. Fl. Sylv. 35; Brandis For. Fl. 36. *E. quinqueloculari*s, Wgt. Ic. t.882.? *Bute, bother, bothi, botku, aranj, budjaridahmun,* Vern.

A small, silvery stellately-pubescent tree. Leaves ovate, orbicular, acute or acuminate at the apex, unequal-sided and cordate at the base, crenate or toothed, dotted on the upper surface with stellate hairs, closely white-tomentose beneath, with 5-7, distinct, basal-nerves; blade 2″-8″; by 2″-6″; petioles ·75″-6″ long. Flowers large, 2″ long, in axillary or terminal, few-flowered cymes; bracteoles 3-5, entire, toothed or pinnatifid, very caducous. Calyx thick, leathery; sepals 1″ long by ·2″ broad, linear-oblong, tomentose on both surfaces. Petals obovate-oblong, as long as the sepals, glabrous; limb pale yellow; claw thick, tomentose, deflexed between the sepals. Staminal-column 1″ long, glabrous, covered at the top with short, filamented, 2-celled anthers. Ovary tomentose;

ovoid; style glabrous above, exserted, 1·25″ long; stigmas 5-10, linear, reflexed, Capsule 5-10-valved, ovoid, woody, rough, sometimes tubercled, ribbed or not, acute or pointed, 1·5″-2″ long by 1″ in diameter. The interior angle of each valve of the capsule is clothed with a dense growth of white, soft, short hairs for about $\frac{1}{3}$ its length which forms a cup or tube of white tomentum at the base of the ripe opened capsule. Seeds with a broad falcate, membranous wing ·75″ long by ·25″ broad.

Fig 92. Eriolæna Candollei, Wall.

I am unable to satisfactorily distinguish between the 4 usually accepted species *E. Candollei, E. Stocksii, E. Hookeriana* and *E. quinquelocularis*, which are founded I think on no constant differentiating characters of importance. The shape of the caducous, involucral bracteoles and other minor differences such as the size of the flowers, fruit and leaves, position of the anthers on the staminal-column and more or less pointed form of the fruit are not in my opinion of specific value.

Graham in his Catalogue gives *E. Hookeriana,* W. & A. as the Bombay species and thinks it is probably identical with *E. Candollei*, Wall. Dalzell and

Gibson only mention one species *E. Candollei,* Wall. in the Bombay Flora. Cooke who has had opportunity for examining the original type specimens at Kew, states his opinion in Fl. Bomb. Pres. 1, 131, that *E. Stocksii,* Hook. f. is scarcely if at all distinguishable from *E. Hookeriana,* W. & A. Beddome distinguishes 2 species in his Flora Sylvatica viz. *E. Hookeriana,* W. & A. and *E. quinquelocularis,* Wgt. on slender grounds and finally Sir D. Brandis, For. Fl. 36, is of opinion that *E. Hookeriana, E. flavescens,* Gracke, and *E. Stocksii,* are probably one and the same. As there is probability that all the above mentioned closely allied if not identical species may eventually be united, I have for practical purposes described only *E. Candollei.*

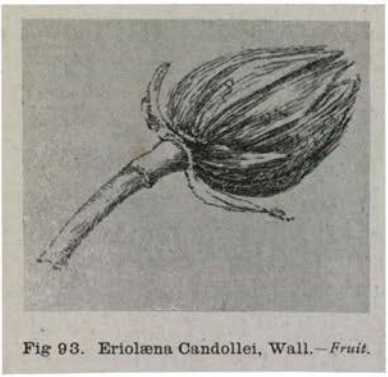


Fig 93. Eriolæna Candollei, Wall.—*Fruit.*

Throughout Central, Southern and Western India, Bhutan and Burmah. Bombay Presidency found in the dry forests of the Khandesh Satpudas where it is abundant at a height of 3700′ in the Akrani. Throughout the deciduous monsoon-forests of the N. Kanara, Belgaum, Deccan and Konkan ghâts, usually sparingly distributed. The old dead and dry leaves and fruit remain on the branches until April. The flower-buds begin to appear in short, silvery, stellately-tomentose racemes along with young leaves about the beginning of April. Nearly always a small tree and scarcely ever yields timber of marketable size. Bark grey-coloured, hard, thin, reddish within. Wood from the Khandesh (Akrani) district brick-red, with irregular masses of black or brown heart-wood, heavy, close-grained, smooth, hard. Annual-rings distinctly marked by a continuous line of pores. Pores moderate-sized, single or in groups or lines surrounded by softer white tissue. Medullary rays white, numerous, moderately broad. Weighs 59 lbs. to the cub. ft. A beautiful, handsomely marked wood. The wood from N. Kanara (*E. quinquelocularis,* Wgt.) is dark-grey or reddish, mottled, hard, heavy, smooth. Pores medium-sized or small, enclosed in rings of soft tissue in concentric lines and joined by bands of white tissue. Medullary rays numerous, white, prominent, moderately broad or fine. Weighs about 56 lbs. to the cub. ft.

Order XVIII.—TILIACEÆ.

Mostly trees or shrubs. Leaves alternate, simple or lobed; stipules deciduous. Flowers regular, pentamerous, hermaphrodite or unisexual. Sepals 3-5, valvate. Petals free, equal in number to sepals. Stamens free or connate, numerous, rarely definite, springing from a dilated torus. Ovary free, 2-10-celled with axile placentation; styles columnar or divided into as many divisions as there are cells to the ovary; stigmas usually distinct, rarely confluent or sessile; ovules attached to the inner angle of the cells, if few pendulous from the apex or ascending from the base, if more numerous disposed in several ranks, anatropous. Fruit fleshy or dry, 2-10 celled. Seeds 1 or many, ascending, pendulous or transverse, albuminous or exalbuminous; no arillus; testa leathery or crustaceous, pilose; embryo straight; radicle next the hilum.

Anthers opening by slits.

Fruit a drupe with several stones, not prickly ... 1. Grewia.
Fruit woody, triangular, 1-seeded, prickly ... 2. Erinocarpus.

Anthers opening by pores.

Fruit a 1-several-seeded, fleshy drupe ... ... 3. Elæocarpus.

GREWIA, LINN.

Trees or shrubs. Leaves entire, 1-9, often 3-nerved. Flowers bisexual or polygamous, axillary or terminal; inflorescence cymose in umbels or panicles. Sepals 5, distinct. Petals clawed, or foveolate glandular at the base, sometimes wanting. Stamens numerous on a raised, often glandular torus which is produced more or less beyond the insertion of the petals and usually adpressed to the gland at their base. Ovary 2-4-celled; ovules 2-many in each cell; style subulate; stigma shortly 2-4 lobed. Fruit a drupe 1-4-stoned, fleshy or fibrous, entire or 2-4-lobed; stones one or more seeded; cotyledons flat; albumen fleshy or horny.

Inflorescence terminal or extra-axillary, umbellate.

Scandent. Leaves rough, or scabrous. 3-nerved.
Drupe glabrescent of 4, separate, flattened lobes 1. G. umbellifera.

Erect shrub. Leaves scabrous. Drupe slightly 4-lobed, bristly ... ... 2. G. columnaris.

Scandent. Leaves glabrescent. Drupe large, depressed-globose, scarcely lobed, yellow, pilose 3. G. orientalis.

A diffuse shrub. Leaves small, glabrous. Drupe small, 2-lobed, orange-red ... ... 4. G. populifolia.

Inflorescence axillary, umbellate.

Leaves hoary beneath.

Scandent or erect. Leaves lanceolate. Drupe globose, dark-coloured, 2-lobed ... ... 5. G. salvifolia.

Shrub. Leaves pubescent on both sides, 5-nerved. Drupe slightly 2-lobed, grey ... ... 6. G. orbiculata.

Tree. Leaves often lobed, 3-5-nerved; stipules falcate, auricled. Drupe 1-4-lobed, black ... 7. G. tiliæfolia.

Tree. Leaves roundish, tomentose, 5-nerved; stipules subacute. Drupe subturbinate, 1-2-celled 8. G. asiatica.

Leaves not hoary beneath.

Shrub. Leaves scabrous. Drupe globose, long-pedicellate, hairy; rind crustaceous, 1-4-lobed, size of a pea; stones pitted ... ... 9. G. pilosa.

Shrub. Leaves 5-nerved, rugose above, villous beneath. Drupe globose; rind crustaceous, 1-4-lobed, size of a cherry, red, pilose ... ... 10. G. villosa.

Tree. Leaves glabrous, lanceolate, serrate. Drupe fleshy, 2-lobed, black, didymous. ... 11. G. lævigata.

Tree or shrub. Leaves scabrous. Drupe fleshy, subglobose, obscurely 4-lobed, size of a pea ... 12. G. abutilifolia.

Shrub. Leaves glabrescent or pilose above, densely tomentose beneath. Drupe fleshy, glabrescent, size of a small cherry, slightly 4-lobed ... ... 13. G. hirsuta.

Inflorescence terminal, panicled.

Leaves glabrescent. Drupe entire, size of a pea, glabrous, 3-celled ... ... 14. G. Microcos.

1. G. umbellifera, Bedd. Fl. Sylv. 37; Fl. Br. I. 1, 393; *G. capitata,* Dalz. Mss.? *G. heterotricha,* Mast.; Fl. Br. I. 1, 385; *G. Ritchiei,* Mast.; Fl. Br. I. 1, 389. *Chinna bally*, K. *Mudkarki*, M.

A lofty climber with scabrous branches. Leaves thin, ovate, acuminate or obtuse at the apex, equal-sided, cordate or acute and sometimes oblique at the base, rough, glabrescent or scabrous above, stellate-hairy beneath; edges glandular-serrate; trinervate at the base with 3-4 pairs of lateral-nerves and distinct parallel anastomosing veins; blade 3″-1·25″ by 1·75″-·75″; petioles ·25″ long. Flowers large, peduncled, densely rufous-tomentose, in axillary or terminal

5-30-flowered umbels; peduncles 1″-2·5″ long; pedicels shorter, 1″-·25″ long; bracteoles linear; buds cylindric or obovoid, sometimes constricted in the centre, more or less longitudinally-ribbed. Sepals ·5″-1″ long, linear, often revolute. Petals ½ the sepals, densely rufous-tomentose outside, stellate-hairy within, oblong-lanceolate; limb petaloid, glabrous, springing from the back of the thick, villous-edged claw which has a depressed shield-like glabrous centre. Torus ·30″ long, glabrous and grooved near the base above the insertion of the petals, clothed with simple hairs above and dilated at the apex; Stamens numerous, ·4″

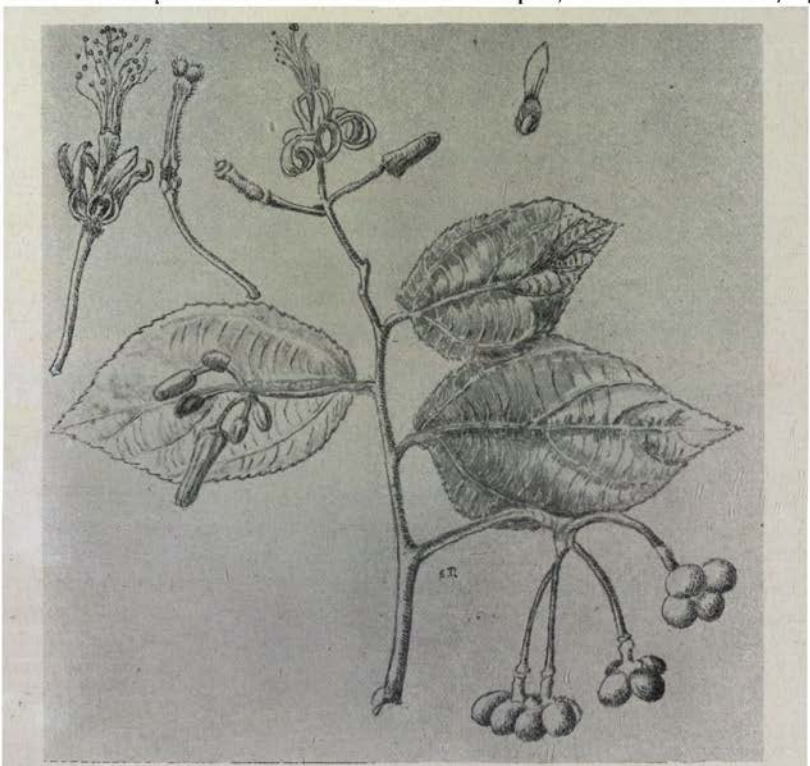


Fig 94. Grewia umbellifera, Bedd.

long, inserted beneath the ovary. Ovary globose, hairy, lobed; style as long as or longer than the stamens; stigma dilated and lobed at the top. Fruit pulpy, deeply 1-4-lobed, reddish-yellow; lobes 1-seeded, glabrous; endocarp flattened, bony; embryo with foliaceous, yellow cotyledons in a fleshy albumen; the pulp becomes mealy when the fruit is yellow and ripe.

Since my "Bombay Trees, Shrubs" etc. was published in 1902 I have had

opportunity for examining growing stems both in flower and fruit of *G. umbellifera*, Bedd. *G. Ritchiei*, Mast. and *G. heterotricha*, Mast. and also have been able to carefully examine good herbarium material of these supposed different species. I am now of opinion that they cannot be separated by any constant specific characters and should, I think, be considered as one. *G. umbellifera*, Bedd. (1871) has priority over the other two and I have ventured to unite the 3 under that specific name.

Apparently endemic in the evergreen rain-forests of the Western ghâts from N. Kanara, southwards to Kurg. Except in the forests near the Gairsoppah falls where it is abundant, I have found it to be elsewhere a rare species. Flowers apparently throughout the dry season and the fruit ripens during the hot and rainy seasons. A lofty climber. The stems are about 2″ in diameter with a smooth greenish or brown bark, covered with large straight or hooked, blunt prickles, often arranged spirally on prominent bands of tissue.

G. umbellata, Roxb. King in As. Soc. Beng. Jour. Vol. 60, (1892), 110 is a Malayan species and not found in this presidency.

2. G. columnaris, Sm.; DC. Prodr. 1, 510; Fl. Br. I. 1, 383; Dalz. & Gibs. Bomb. Fl. 26; Cooke Fl. Pres Bomb. 1, 138; Wight's Icones t. 44; Grah. Cat. Bo. Pl. 21; *G. carpinifolia*, Wall.

A stout shrub. Leaves 3-nerved, scabrous, ovate-acuminate, glandular-serrate; blade 2″-3″ by 1″-1·5″; petioles ·25″ long. Flowers white, in axillary or terminal, corymbose umbels; buds conical, sulcate Sepals ·3″ long, yellow, 3-nerved. Petals ½ the calyx, ovate, entire; gland densely villous above, less so on the sides. Torus short, villous, simple hairy at the top. Ovary densely hairy; style exceeding stamens; stigma 5-lobed Drupe ·5″ in diameter, slightly 4-lobed, bristly-hairy, subglobose, purplish; stones 4, 1-2-celled.

W. Peninsula, Bengal and Ceylon, Bombay, " Malabar Hill, Salsette, etc." Grah., Mysore; mentioned in Dalz. & Gibs. Bomb. Fl., but no locality is given. The fruiting specimens collected in Mysore on the Bababudan hills near (Santaveri) and in the N. Kanara evergreen rain-forests are somewhat imperfect and cannot, I think, with certainty be referred to *G. columnaris*, Sm. Doubtfully indigenous in this presidency.

3. G. orientalis, Linn.; DC. Prodr. 1, 50; Fl. Br. I. 1, 384; Dalz. & Gibs. Bomb. Fl. 26.

A large, erect or scandent shrub. Leaves elliptic, shortly acuminate, obtuse or sometimes slightly cordate at the base, crenate-serrulate, glabrous above, glabrescent beneath; blade 3″-2.5″ by 1″-1·25″; petioles ·25″-·5″ long. Flowers in axillary or terminal, 2-3-flowered cymes, crowded near the ends of the branches; buds ovoid, pilose, ribbed; peduncles ·5″ long, stout; pedicels as long. Sepals linear, rusty-tomentose outside, yellow within and glabrous, nearly 1″ long. Petals ⅓ the length of the sepals, entire or emarginate; gland longer than half the petal, very densely hairy on the thick margins. Torus short, tomentose,

Fig 95. Grewia orientalis, Linn.

4-angled; the lower glabrous part, against which the petal-claws are applied, is over-ridged by the tomentose part. Drupe globose, wrinkled, yellow, ·75″-1″ across; top flattened, very obscurely lobed, tomentose, with long rusty hairs; endocarp fibrous; stones 4, 2-3-celled. The comparatively large, flattened angular fruit is characteristic of this species.

Southern Provinces of the W. Peninsula and Ceylon, 'S. ghâts,' Dalzell. This small tree I have found rather common in deciduous forests on the Bababuden Hills of Mysore at 3000′ elevation. Fl. May-Jun. Fr. Sept.-Oct. Doubtfully indigenous in the Bombay Presidency.

4. G. populifolia, Vahl. DC. Prodr 1, 511; Fl. Br. I. 1, 385; Brandis For. Fl. 38. *Gingo*, Vern.; *Gungo*, Sind.; *Jijani*, K.

A small, much branched shrub. Leaves glabrous, coriaceous, ovate or obovate, crenate-serrate, 3-5-nerved, oblique at the base; blade ·5″-1·5″ by ·5″-·75″; petioles ·25″ long, slender. Flowers ·75″-1″ across, white, on axillary or terminal peduncles, thickened at the top, 2-bracteate and usually 1-flowered; buds obovoid, grey-tomentose, 5-ribbed. Sepals ·5″-·75″ long, linear-oblong. Petals

Fig 96. Grewia populifolia, Vahl.

shorter than the sepals; blade linear, springing from the back of the very tomentose claw, notched at the top; gland broad, sub-orbicular or lobed, villous on the margins. Torus short. Fruit deeply 2-lobed, yellow, reddish, shining; lobes 2-celled; stones 1-4, muricate, 1-2-celled.

Sind and the Punjab, W. Peninsula; throughout the dry districts of the Bombay Presidency. In the Dharwar District the flowers and fruit appear during the rainy season. Usually a large or small shrub 2'-6' high. Bark white, fissured, corky. Wood hard, yellow, close-grained; used for walking-sticks. Fruit edible.

5. G. salvifolia, Heyne in Roth. Nov. Sp. 239; Fl. Br. I. 1, 386; Brandis For. Fl. 43; Cooke Fl. Pres. Bomb. 1, 140. *Bihul*, Sind; *Ulpi*, K.

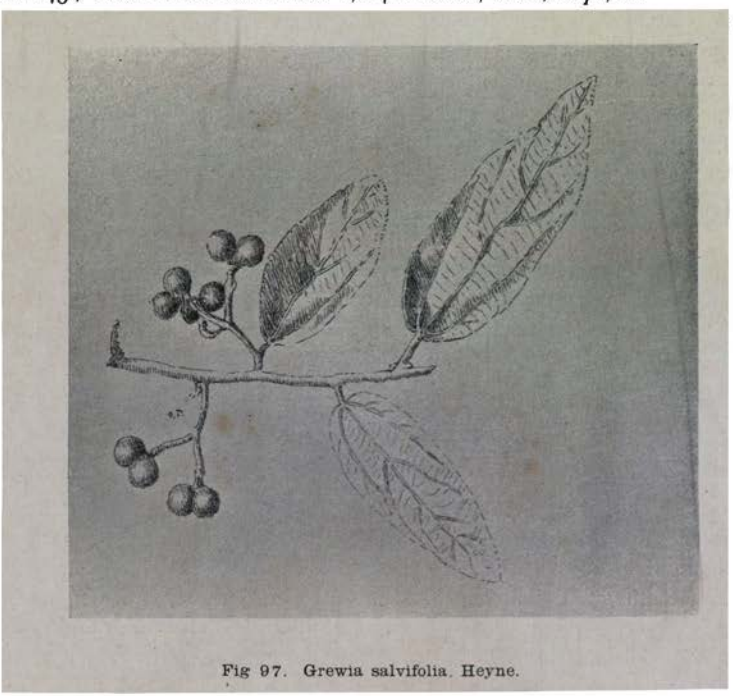


Fig 97. Grewia salvifolia. Heyne.

An erect or scandent shrub or small tree. Leaves lanceolate, obtuse or apiculate, serrulate, 3-nerved, oblique at the base, glabrous above, white hoary-tomentose beneath; blade 2"-3" by ·5"-·75"; petioles ·25" long; stipules linear. Flowers small, yellow, on axillary, 1-3-flowered peduncles ·25" long; buds ovoid-oblong, striate. Sepals ·5" long, linear, 3-nerved. Petals bifid, shorter than the sepals; limb yellow, from the back of the thickened, hairy glandular

claw. Drupe usually 2-lobed; lobes globose, size of a small pea; endocarp hard bony, 2-seeded.

N. W. Himalaya from the Jhelum to Nepal, W. Peninsula; dry forests near Badami, Bijapur District; Sind and the Punjab, S. India, the C. Provinces and Africa. Fl. hot season. Fr. Sept.-Oct. This species is perhaps not distinct from *G. excelsa*, Vahl. A small tree. Bark hard, dark-coloured, fissured but not scaly; reddish layers within. Wood yellow-brown, hard, close-grained. Annual-rings distinctly marked by a line of pores. The branches make excellent walking sticks.

6. G. orbiculata, Rottl. in Nov. Act. Nat. Cur. Berol. (1803), 205; Fl. Br. I. 1, 386; Cooke Fl. Pres. Bomb. 1, 141; *G. rotundifolia,* Juss. Wgt. Ic. t. 45. ?

Western Peninsula, Konkan and Malabar. I am unacquainted with this species which has been collected apparently only by Ritchie on the Gokak hills, Belgaum. *G. pilosa*, Lam. is common in the same locality. Wight's figure of *G. rotundifolia* in the Icones appears to be a representation of *G. pilosa*, Lam.

7. G. tiliæfolia, Vahl. Symb. 1, 35; Fl. Br. I. 1, 386; Dalz. & Gibs. Bomb. Fl. 26; Bedd. Fl. Sylv. 37; Brandis For. Fl. 41; Gamble Ind. Timb. 109. *Dadsal, butale*, K.; *Dhamani*, M.; *Dhamana*, Guz.

A large, deciduous tree with cinerous, exfoliating bark. Leaves ovate, sometimes rhomboidal or 3-lobed, obliquely-cordate, acute or obtuse at the base, acuminate at the apex, bluntly crenate-serrate, sparsely stellate-pubescent or glabrous above, stellate-tomentose, often white beneath, stellate-pubescent on the nerves; basal-nerves 5; blade 2″-5·5″ by 1″-4″; petioles 1″-·5″ long; stipules ·3″ long, leafy, falcate, veined and auricled, deciduous. Flowers small, in axillary umbels; peduncles ·5″-1″ long, axillary, 3-8-fascicled, 3-flowered; pedicels shorter than the peduncles; buds ovoid, grey-tomentose, 5-ribbed; bracteoles linear-lanceolate. Sepals linear-ovate ·5″ long, glabrous, white-tomentose outside and yellowish within. Petals ovate, emarginate, yellow, turning purple, much shorter than the sepals; basal-gland green and densely white-villous on the margins and often more than 1/3 the length of the petal. Torus short, ribbed, glabrous, obscurely toothed and hairy at top. Stamens with purple filaments and yellow anthers. Ovary globose, villous; style longer than the stamens; stigma peltate, irregularly 5-lobed. Drupe 2-4-lobed, but not deeply, size of a pea, black; lobes several-seeded. This species varies considerably in the amount and density of the pubescence, size and shape of leaves and length of the torus. The tomentose variety from the Deccan hills near Poona, Sir D. Brandis treats as a separate and new species *G. leptopetala,* Brandis; I am of opinion however that it may be only a sexual form of *G. tiliæfolia*, Vahl.

Generally found in the Deccan and along the Konkan ghâts, ascending to 4000′ in the Satpuras; Sub-Himalayan region from the Jumna to Nepal,

ascending to 4000′; C. & S. India, Burma and Ceylon; throughout the deciduous monsoon-forests of the Bombay Presidency; common in the Khandesh Satpuras (Akrani) at 3700′ alt., also in N. Kanara, where it attains a large size. Fl. March-May. Fr. R. S. Fresh foliage and flowers appear when the stems are quite bare of leaves in April. Sapwood light-coloured. Heart-wood reddish-brown, compact, elastic, smooth. Annual-rings distinct. Pores developed considerably in the spring-wood, medium-sized, round, in rings of white tissue. Medullary

Fig 98. Grewia tiliæfolia, Vahl.

rays moderately broad and fine. Easily worked and durable. Useful for agricultural-implements, shafts of carriages, etc. The Kanara wood weighs 50 lbs. to the cub. ft. and the value of P. was found to be 650. Logs of ½-1 ton can be had in some of the N. Kanara forests. Fruit edible. Inner bark yields a useful cordage.

8. G. asiatica, L.; W. & A. Prodr. 1, 79; Fl. Br. I. 1, 386; Dalz. & Gibs. Bomb. Fl. 26; Brandis For. Fl. 40; Bedd Fl. Sylv. 37. *Dhamin phalsa, phulsee,* H.

A small tree. Leaves rounded, broadly ovate, acuminate, obliquely-cordate or acute at the base, irregularly toothed, with 5 arching nerves from the base, white or grey-tomentose beneath; blade 2″-7″ by 1″-2·5″; petioles yellow-pubescent, ·5″ long, thickened above; stipules linear, oblique from a broad base. Peduncles 2-7, axillary, about 1″ long, grey-tomentose; pedicels shorter; buds ovoid, or clavate, ribbed. Sepals ·3″-·5″ long, yellowish, glabrous within, grey-tomentose without. Petals reddish, ·25″ long; limb twice as long as the claw, emarginate; gland white, villous on the margins. Torus ·15″ long, glabrous, distinctly toothed at the top. Ovary villous; stigma 4-lobed; lobes laciniate. Drupe globose, size of a pea, scarcely lobed, dark-brown, pilose.

Generally cultivated in India, somewhat extensively so in Guzerat. Indigenous in the Poona district of the Bombay Presidency on stony trap hills, also found in Sind near Karachi and in Oudh and Ceylon. A small tree. Bark rough, grey. Wood yellowish-white, hard and close-grained. Fruit edible. Bark used for rope-making. Fl. Feb.-Mar. Fr. May-June.

9. G. pilosa, Lam. Dict. 3, 43; Fl. Br. I. 1, 388; Dalz. & Gibs. Bomb. Fl. 26; Brandis For. Fl. 39. *Kirkali,* K.

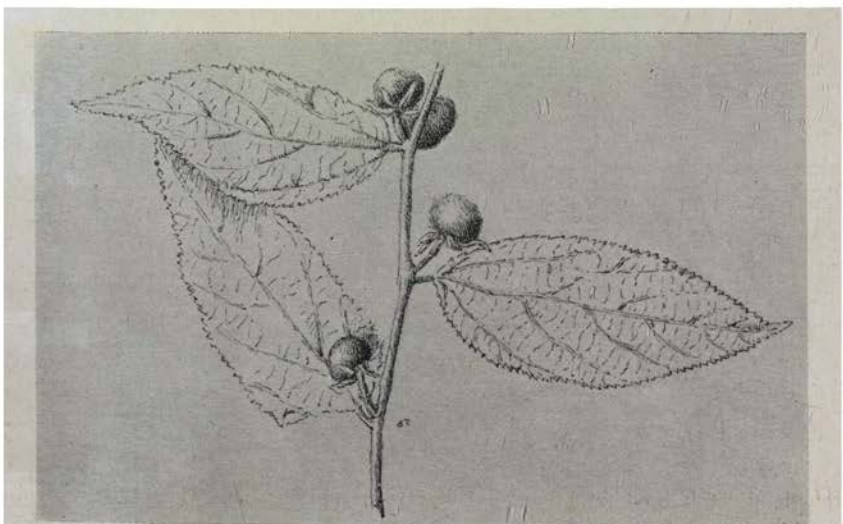


Fig 99. Grewia pilosa, Lam.

A shrub. Leaves cuneate-obovate, often slightly oblique and cordate at the

base, subcoriaceous, rough, stellate-hairy above, softer-hairy beneath, unequally serrate, 3-nerved at the base and with 3-4 pairs of prominent lateral-nerves; blade 1″-4″ by ·5″-2″; petioles ·25″ long; stipules linear-subulate. Flowers in short, axillary umbels; peduncles axillary, short, ·25″ long, 1-3 together; pedicels as long as the peduncles; buds oblong, ribbed, tomentose, constricted in the middle. Sepals ·6″ by ·10″, linear, pale-yellow within. Petals ⅓ shorter, bifid; gland ⅓ the length of the petal, pilose at the back and on top and margins. Torus short, thick, glabrous and dilated at the top. Anthers simple or stellate hairy. Ovary and style densely clothed with white or brown hairs. Stigma pappilose, 4-toothed or partite. Drupe 1-4, rather deeply lobed, on stout, deflexed peduncles, stellate-hairy; stones with a crustaceous epicarp; endocarp thick, bony, smooth, fibrous; cells several.

C. & S. India, from Guzerat to Behar. Throughout the drier districts of the Bombay Presidency, abundant in the deciduous forests near Badami, Bijapur; in the W. Khandesh Akrani at 3700′ elevation. A climber with smooth, black bark and flattened angular branches, used for making baskets. Fl. May-July. Fr. Sept.

10. G. villosa, Willd. in Nov. Act. Nat. Cur. Berol. (1804), 205; Fl. Br. I. 1, 388; Dalz. & Gibs. Bomb. Fl. 25; Brandis For. Fl. 39. *Kharmati,* M.

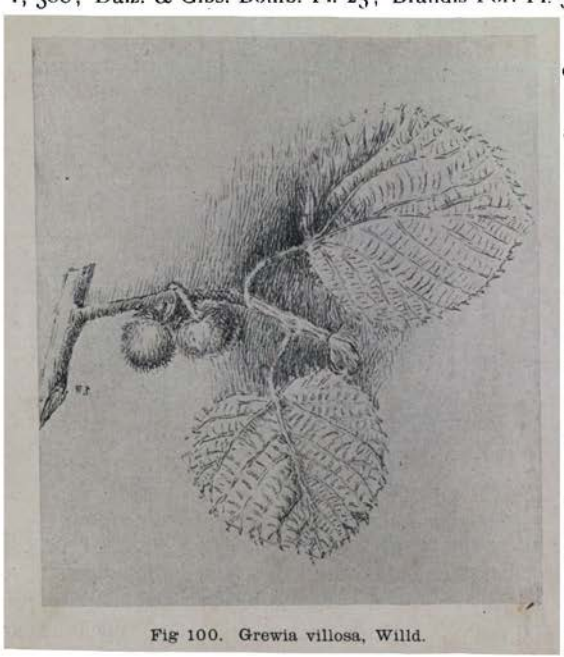


Fig 100. Grewia villosa, Willd.

A shrub; young parts densely white-hairy. Leaves orbicular, cordate at the base, acuminate, at the apex, sharply serrated, serratures bearded, rugulose above, villous beneath; basal-nerves 3-6; veins parallel, very distinct; blade 1″-3″ across; petioles ·5″-1″ long; stipules broad, leafy, deciduous. Flowers axillary, in sessile cymes, small; buds yellowish, ellipsoid, hairy Sepals ·35″ long, oblong, villous, Petals much shorter. notched; gland orbicular-oblong, ciliate, half the length of the petal. Ovary densely pilose; style hairy; stigma lacerate. Drupe globose, coppery, with a

crustaceous rind, stellate-hairy; stones 4, 1-2-seeded, in a sweet edible pulp. Fruit and leaves characteristic.

W. & S. India from Sind to Travancore, sparingly distributed in the Deccan and Sind. I have found it in the dry forests near Gokak, Belgaum District. Brandis says it is found in the Konkan. Fl. June-Sept. Fr. Oct-Nov. Fruit considered "very delicious" by Dalzell.

11. G. lævigata, Vahl. Symb. 1, 34; Fl. Br. I. 1, 389; Brandis For. Fl. 42; Bedd. Fl. Sylv. 37. *Kaori, gurguri,* K.; *Gulgollop,* Kon., *Chiken,* Bhil.

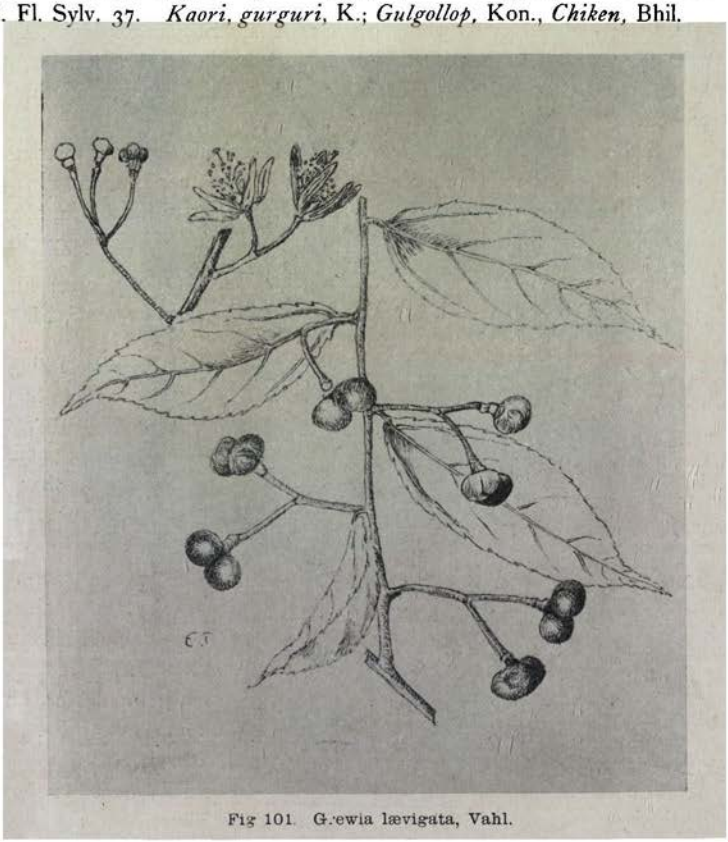


Fig 101. Grewia lævigata, Vahl.

A small tree with slender, nearly glabrous branches; young leaves with scattered, stellate hairs. Leaves bifarious, ovate-lanceolate, long-acuminate at the apex, base acute, serrate; 3-nerved at the base with 6 pairs of lateral-nerves besides; veins parallel; blade 3″-5·5″ by ·5″-1·5″; petioles ·5″ long; stipules linear, subulate. Flowers yellowish; buds ovoid-oblong or globose, grey-tomentose,

scarcely ribbed; peduncles axillary, 2-3 together, slender, about 1″ long, 2-3 flowered; pedicels shorter or as long as or longer than the peduncles; bracteoles linear, caducous. Sepals ·5″ long, linear, pilose outside. Petals oblong, obtuse, ⅓ the lengh of the sepals with a brown, glabrous triangular tip; gland thick, covering the whole petal except the triangular tip, hairy on the top and margins. Torus rather long, ribbed, the lower part glabrous, short hairy above. Ovary pilose; style longer than the stamens; stigma lobed. Drupe smooth, 1-4-lobed, size of a pea, black when ripe; stones 1-celled; pedicels slightly clavate at the top.

E. Himalaya, Khasia hills, W. & S. India and Burma. North Kanara and Konkan, near village sites and in deciduous monsoon-forests, not common. Fl. R. S. Fr. R. & C. S. Wood rather heavy, fibrous, close-grained, soft, white, yellowish or brownish. Bark yields a fibre.

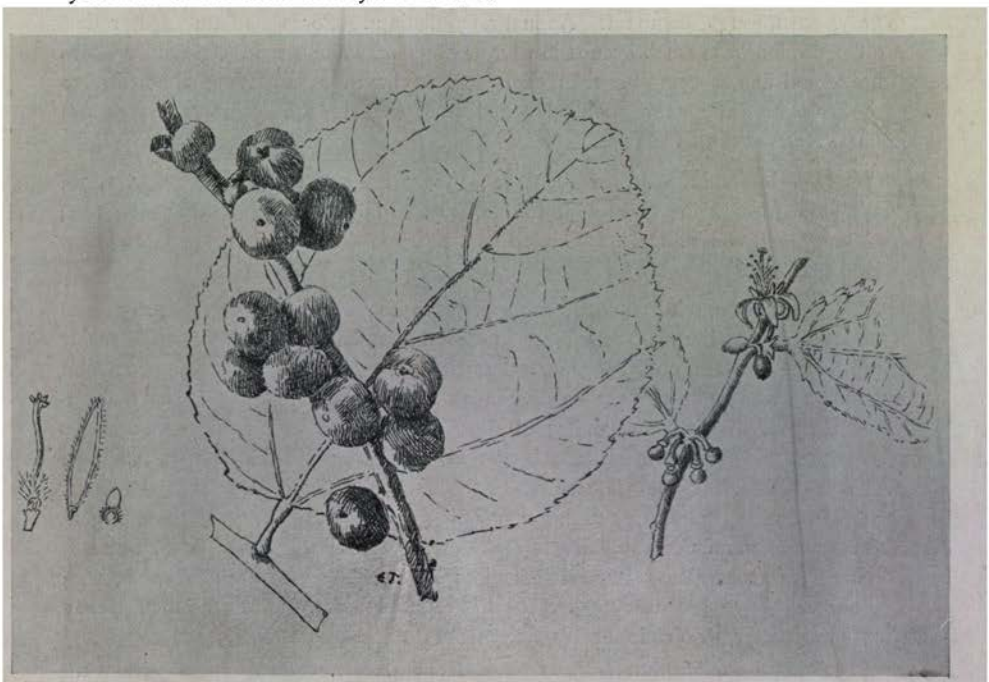


Fig 102. Grewia abutilifolia, Juss.

12. G. abutilifolia, Juss. in Ann. Mus. IV, 92; Fl. Br. I. 1, 390; Dalz. & Gibs. Bomb. Fl. 26; Cooke Fl. Pres. Bomb. 1, 144; Bedd. Fl. Sylv. 37; *G. aspera,* Roxb. *Karikawdi, kowri,* K. *Khar phulsa, dhaman,* M.

A large shrub or small tree. Leaves scabrous above, stellately-tomentose

beneath, broadly ovate, acute or acuminate, irregularly toothed, often lobed at the top, subcordate but usually entire and trinervate at the base; basal and lateral-nerves strong beneath; blade 3″-5·5″ by 2″-3·5″; petioles ·5″-·75″ long, thickened at the top. Flowers white, in small, contracted, axillary cymes; buds ovoid or oblong, grey-pilose, obscurely striate or ribbed. Sepals linear, ·3″ long. Petals much shorter, broadly ovate, entire, obtuse; gnd alabout ½ as long as the petal, with a villous margin. Torus short, hairy at the top. Ovary hairy; style longer than the stamens; stigma 4-lanceolate-lobed. Drupes fleshy, irregularly globose, scarcely lobed, greenish-yellow, more or less stellate-hairy, on deflexed, short, stout pedicels, size of a small cherry; stones 1-4, each 1-2-celled.

W. Peninsula from N. Kanara to Malabar, in N. Kanara along nalas and in moist shady places. Flowers during May and June. Fr. ripe Aug.-April. Wood grey, hard, tough, compact. Annual-rings distinct. Pores medium-sized, round often divided or in small groups in narrow rings of white tissue. Medullary rays broad and fine, 4-5 fine between each pair of broad rays. Weighs 48 lbs. to the cub. ft. The short stout deflexed fruit-pedicels and scabrous leaves are characteristic of this species.

13. G. hirsuta, Vahl. Symb. 1, 34; Fl. Br. I. 1, 391; W. & A. Prodr. 1, 78; Wight Icones t. 76; Roxb. Fl. Ind. 2, 587; Cooke Fl. Pres. Bomb. 1, 144; *G. polygama,* ~~Roxb.~~ Dalz. & Gibs. Bomb. Fl. 26; *G. lancæfolia,* G.; Grah. Cat. Bomb. Pl. 21.?

A large, much-branched, straggling shrub; branches long, slender with fibrous bark. Leaves distichous, lanceolate, stellately pilose above, densely tomentose beneath, oblique, 3-nerved at the base, serrate; nervation prominent beneath; blade 1″-2·5″ by ·3″-·75″; petioles very short, ·1″ long. Flowers polygamous (male and hermaphrodite) in short, axillary, cymose clusters; peduncles 1-3; pedicels very short; bracteoles linear, hairy; buds ovoid, globose, densely villous. Male fl.: Sepals linear-ovate, ·25″ long. Petals ·1″ long, orbicular, hairy at the back; gland entire, thick, occupying ¾ of the petal, hairy on the margins. Stamens numerous on the hairy top of the short torus. Hermaph. fl. same as male but with a villous ovary; hairs as long as the filaments; anthers small; style glabrous; stigma dilated, penicillate. Drupe globose, slightly 4-lobed, fleshy, ·5″ in diameter, wrinkled, shining, hairy; stones 4, 2-celled.

I am of opinion that *G. polygama,* Roxb. has not been found within the limits of the Bombay Presidency and that hitherto either *G. hirsuta,* Vahl. or *G. pilosa,* Lam. has been confounded with this species. Graham in his Handbook gives *G. hirsuta,* W. & A. = *G. pilosa,* Roxb. and *G. lancæfolia,* G. as indigenous Bombay *Grewias.* Dalzell mentions in the Bombay Flora *G. pilosa,* Lam. = *G. carpinifolia,* Roxb. and *G. polygama,* Roxb. It will thus be seen that both these authors only make 2 species out of the 3 viz. *G. pilosa,* Lam. *G. hirsuta,*

Vahl. and *G polygama,* Roxb. given in the Fl. Br. I. by Maxwell. T. Masters. Of the 2 mentioned by Graham one, viz. *G. lancæfolia,* G. Dalzell takes to be *G. polygama*, Roxb. I think it more probable that Graham's plant was simply *G. lævigata,* of Vahl. Sir D. Brandis in the Flora of the N. W. & Central Provinces quotes the Konkan as one of the habitats of *G. polygama,* Roxb. probably on the authority the Fl. Br. I. *G. polygama,* Roxb. is found in the N. W. Provinces along the Himalayas ascending to 4000′ also in Pegu and Ceylon. It has been I think confounded with the equally polygamous Western peninsular species *G. hirsuta,* Vahl. with which it is closely allied if not identical and with *G. pilosa,* Lam. both common in Bombay. I have never seen specimens of *G. polygama,* Roxb. from Bombay and am not aware that there are any either in the Kew or Calcutta herbaria from that Presidency.

The Konkan, Deccan forests, southern provinces of the Western Peninsula and Ceylon. A scandent shrub, common in the dry parts of the Belgaum district (Gokak), also near Dharwar, often in hedges, also found on the Bababuden Hills of Mysore, in open deciduous monsoon-forests. The penicillate stigmas and shining coppery drupes are characteristic. Fl. R. S. Fr. C. S.

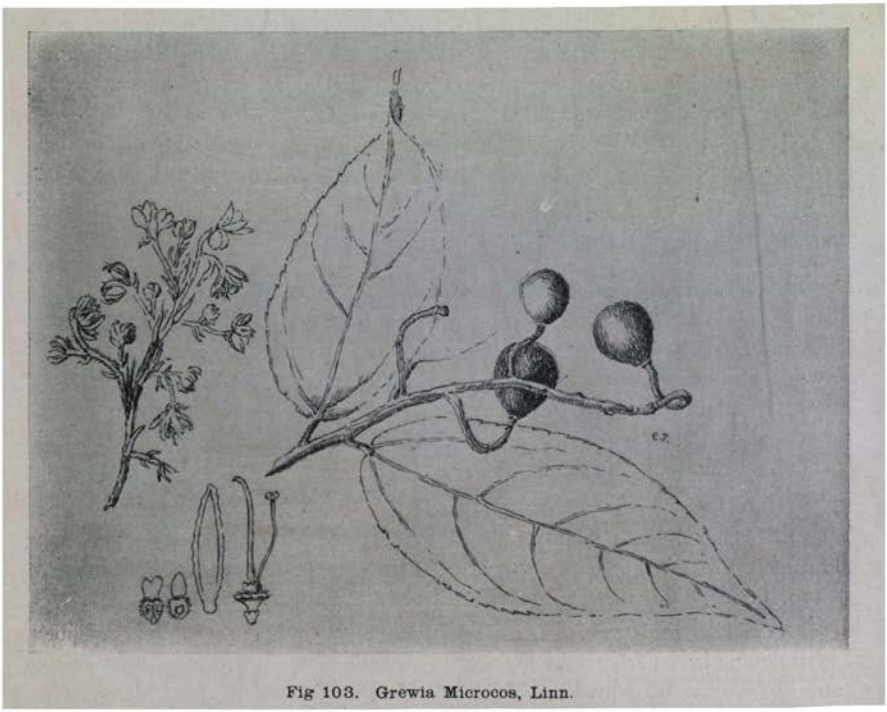


Fig 103. Grewia Microcos, Linn.

14. G Microcos, L.; DC. Prodr. 1, 510; Fl. Br. I. 1, 392; Dalz. & Gibs. Bomb. Fl. 26; Gamble Ind. Timb. 112; Cooke Fl. Pres. Bomb. 1, 145. *Shirul, asolin, pachawi,* M.

A large shrub. Leaves distichous, ovate, or ovate-lanceolate, acuminate, serrulate or entire, slightly repand, glabrous or stellately-hairy on the nerves beneath also on the nerves above, base 3-nerved; blade 6″-9″ by 2″-3″; petioles ·25″ long; stipules subulate. Flowers yellow, in terminal panicles; bracts and bracteoles tomentose, linear, broad at the base, caducous; buds obovoid, ovoid or globose, grey-tomentose, ribbed; pedicels very short. Sepals oblong, pubescent, ·25″ long. Petals ⅓ the sepals, entire or emarginate; gland thick, ciliate on the margins and back which has also a sinus. Filaments slightly pubescent. Ovary glabrous; style longer than the stamens; stigma very minutely lobed. Fruit globose or pear-shaped ·4″-·5″ in diameter, size of a large pea, on deflexed pedicels, black when ripe; stone fibrous, 1-celled and 1-seeded.

Eastern Bengal, Khasia Mountains, Burma, W. Peninsula from the Konkan southwards to Ceylon; in the jungles on the Wada ghát below Mahableshwar on trap; common in N. Kanara from the sea-level up to 2500′, either in evergreen rain or deciduous monsoon-forests or in open places, also on the sea shore of this district near Karwar, Belekerry etc., associated with *Spinifex, Vitex Negundo,* and *Ipomeæ biloba.* In waste places near Khanapore, Belgaum, on granitic soil but never more than a large shrub. Fl. R. S. Fr. C., S.

Bark smooth. Wood grey, soft. Pores scanty, moderate-sized, joined by concentric, broken, wavy bands of soft tissue. Medullary rays very short, moderately-broad.

2. ERINOCARPUS, NIMMO.

A tree. Leaves large, cordate, toothed, 5-9-nerved; stipules deciduous. Flowers large, yellow, in terminal panicles. Sepals 5, long, narrow, ligulate, brown, glandular-tomentose outside. Petals 5, clawed, glandular at the base, inserted round the base of the torus. Stamens many on the raised torus, free or united at the base. Ovary 3-celled; cells 2-ovuled; style filiform; stigma minute. Fruit woody, triangular, spiny, 1-celled, indehiscent. Seed pendulous; albumen fleshy; cotyledons ovate, flat.

E. Nimmonii, Grah. Cat. Bomb. Pl. 21; Dalz. & Gibs. Bomb. Fl. 27; Cooke Fl. Bomb. Pres. 1, 146; *E. Nimmoanus,* Mast.; Fl. Br. I. 1, 394; Bedd. Fl. Sylv. t. 110. *Chor, choura, chira, haladi,* M.; *Adwi-bhendy,* K.

A middle-sized tree. Leaves long-petioled, round, cordate, 5-7-lobed, coarsely and irregularly toothed, glabrous above, pubescent beneath; basal-nerves strong beneath; blade as large as 9″ by 10″ across; petioles 2″-4·5″ long, stout.

Fig 104. Erinocarpus Nimmonii, Grah.

Flowers yellow, 2″ across, in lax, terminal panicles; buds 1-4, ovoid or obovoid, constricted in the middle, 5-toothed and sulcate at the apex, (teeth sometimes reflexed), rusty-tomentose without, enclosed in a thick, spathaceous, irregularly splitting rusty or scaly-tomentose, caducous bract. Sepals linear, acute. Petals with a short claw, exceeding the sepals; claw stellately red-tomentose within with a bare, glabrous glandular spot, tomentose without, like the sepals. Filaments more or less united and hairy at the base. Ovary rufous-hairy; style long filiform; stigma acute. Capsule 2″ by 1·5″, sometimes 6-seeded, echinate.

Deccan, Konkan and N. Kanara, common in the mixed monsoon-forests of the Belgaum District and on the ghâts below Mahableshwar. Fl. Aug.-Oct. A small or moderate-sized tree. Bark grey, smooth, scaly. Fr. C. & H. seasons. Wood dark-grey, moderately-hard, smooth. Annual-rings distinct. Pores medium-sized or small in groups surrounded with white tissue. Medullary rays broad and fine, 4-5 fine between each pair of broad. Weighs above 50 lbs. to the cub. ft. Used for yokes and rafters, Watt. The obovoid dark-brown flower-buds are in threes enclosed in an involucre of 3-4 deciduous bracts; and are crowned with 5 green, linear, stigma-like extensions of the sepals. The bark is said to yield an excellent fibre for ropes.

3. ELÆOCARPUS, Linn.

Evergreen trees. Leaves simple, alternate. Flowers in axillary drooping racemes, usually bisexual. Sepals 5. Petals 5, fringed or lobed, inserted round the base of the thick, glandular torus. Stamens numerous inserted on the torus between the glands; anthers linear, opening by a pore or transverse valve at the apex. Ovary sessile, 2-5-celled; ovules 2 in each cell; style columnar. Fruit a drupe with a bony, tubercled, 1-5-celled stone; seeds 1 in each cell, pendulous; albumen fleshy; cotyledons broad, flat.

Drupe 5-celled, 5-seeded *(Sec. Ganitrus)* ... 1. E. Ganitrus

Drupe 1-3-celled. Anthers bristly or not at the apex *(Sec. Dicera)*

Anthers tipped with a few bristles. Drupe oblong, sometimes slightly falcate, 1-celled, 1-seeded... 2. E. serratus

Anthers without bristles. Drupe ovoid, straight, 2-celled, 2-seeded ... ... 3. E. oblongus

Drupe 1-celled. Anthers terminated with a long awn *(Sec. Monocera)*

Stamens 70-80, awns erect ... ... 4. E. tuberculatus

Stamens 20; awns ultimately reflexed... ... ... 5. E. Munroii

1. E. Ganitrus, Roxb. Fl. Ind. 2, 592; Fl. Br. I. 1, 405; Dalz. & Gibs. Bomb. Fl. 27; Brandis For. Fl. 43; Bedd. Fl. Sylv. 36. *The Utrasum Bead Tree. Rudrack*, H.; *Rudraksh*, M.

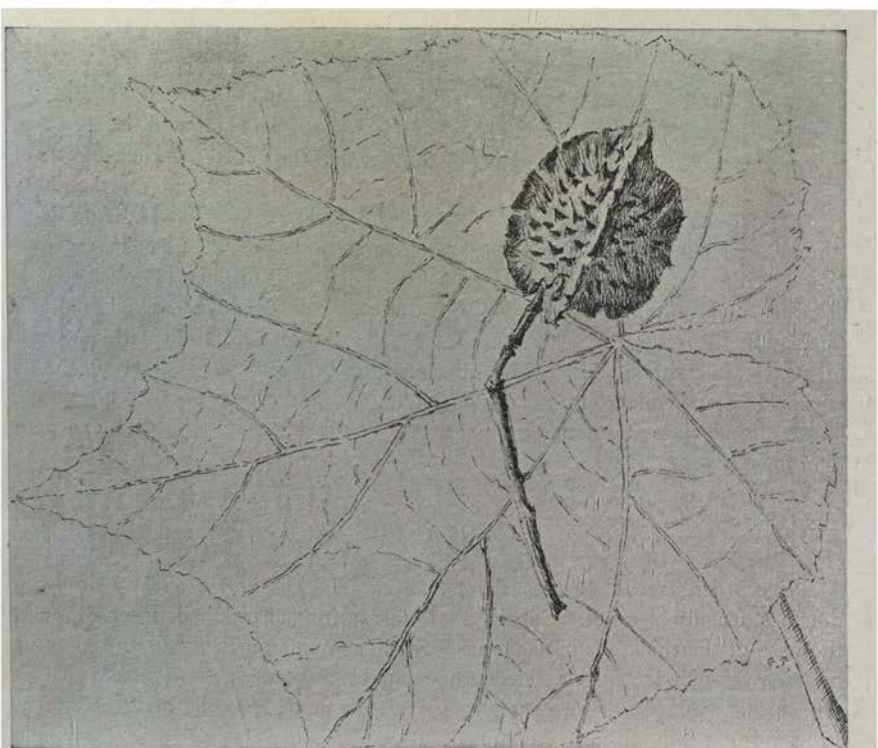


Fig 105. Erinocarpus Nimmonii, Grah.

A middle-sized tree. Leaves shortly petioled, elliptic-lanceolate, serrulate,

ultimately glabrous; blade 4"-6" by 1"-1·75"; petioles about ·3" long; stipules minute, caducous. Flowers ·5" across, white, in short, axillary racemes from the old wood. Sepals ·25" long, slightly villous, 1-ribbed on the inside. Petals laciniate ½ way down. Stamens 35-40; anthers with a few shining hairs, dehiscing by a transverse valve at the apex. Ovary 5-celled; style 5-grooved. Drupe size of large cherry, deep-purple, about 4-seeded at the upper end of axis; stone tubercled and with 5, equidistant grooves.

Nepal, Assam and according to Dalz. & Gibs. on the higher Konkan ghâts. Fl. C. S. The tubercled stones are polished and made into neck ornaments usually worn by Fakirs. This species is now considered doubtfully indigenous in the W. Peninsula.

2. E. serratus, L.; W. & A. Prodr. 1, 82; Fl. Br. I. 1, 401; Bedd. Fl. Sylv. 38; Brandis For. Fl. 43. *Kumbanga, chaughale,* K.

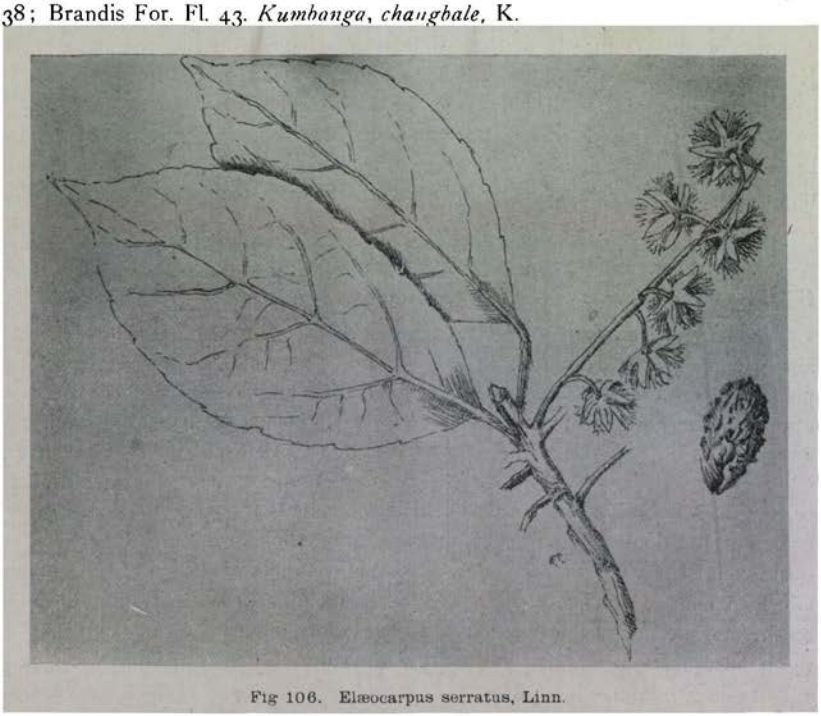


Fig 106. Elæocarpus serratus, Linn.

A large or moderate-sized tree. Leaves ovate or obovate, bluntly acuminate, coriaceous, glabrous, shallowly serrate, with saccate glands in the nerve-axils; lateral-nerves about 5 on each side of the midrib, arching upwards; blade 4"-2" by 2"-1"; petioles ·3"-·75" long, glabrous or pubescent, with 2 small glands at

either side of the apex. Flowers white, in simple racemes from the axils of the leaves and shorter than them; pedicels ·25″ long, tomentose; buds ovoid, 5-ribbed. Sepals narrow, ovate, acute, speckled over with irregular raised dots and sparsely hairy or glabrous on the outside, 1-ribbed within. Petals inserted at base of the torus, laciniate half way down, as long as the sepals. Stamens about 30; filaments very short, inserted on the torus; anthers linear, erect, ·1″ long and with 4-5, often reflexed bristles at the apex, on the outer valve. Torus thick, lobed, tomentose. Ovary grey-tomentose; style filiform, longer than the stamens, hairy and thicker at the base; stigma acute. Drupe 1·3″-·75″ by ·5″, ovoid, pointed, slightly curved or straight, rough with raised white minute discs stone 3-valved, 1-celled, deeply tubercled and divided into 3 short claws at the tip.

Tropical Himalaya, Sikkim 2-3000′, E. Bengal, E. & W. Peninsula, Ceylon; common in the W. forests of the Madras Presidency; on the S. ghâts of N. Kanara, from the sea-level upwards; common near the falls of Gairsoppah in evergreen rain-forests. Fl. Nov.-Dec. Fr. Feb.-Apl.

A moderate-sized tree. Bark smooth, dark-coloured; inner-bark dark-brown, fibrous, ·75″ thick. Wood grey, soft, light, almost spongy. Pores small, uniform. Medullary rays moderately-broad. Fruit is eaten in Madras and in Bengal, where it is called *Julpai* or *Wood olives.*

3. E. oblongus, Gærtn.; W. & A. Prodr. 82; Fl. Br. I. 1, 403; Dalz. & Gibs. Bomb. Fl. Sylv. 27; Bedd. Fl. Sylv. 38. *Khas, kassoo, gurmoot, wowali,* M.

A large, evergreen tree with smooth bark. Leaves ovate or obovate, abruptly acuminate, distantly shallowly serrate, glabrous above, sparingly rufous-pubescent on the nerves or glabrous beneath; lateral-nerves about 6 pairs, strong beneath, and often arching and anastomosing a long way from the margin; blade 3″-6″ by 1·5″-3″; petioles 1″-2″ long, often glandular at the apex. Flowers in axillary racemes about 3″ long, crowded near the ends of the branches along with the leaves; pedicels slender, ·1″-·25″ long; buds ovoid-conical, ·1″-·2″ long. Sepals with a strong longitudinal keel on the inner surface, ovate, acute, nearly glabrous. Petals broadly triangular, inserted at base of the lobed, tomentose torus, as long as the sepals, laciniate ⅓ of their length, ciliate on the margins. Stamens 30-40; filaments short, in groups opposite each of the petals, inserted between the lobes at the top of the torus and V-shaped; anthers linear, erect, without bristles at the apex, puberulous. Torus thick, brown-tomentose, 5-10-lobed at the base. Ovary seated on torus; cells 3, each 2-ovuled, grey hairy-tomentose; style slender slightly exceeding the stamens or equal to them; stigma acute. Fruit ovoid or obovoid, 1″-1·25″ long; stone very hard and woody, tubercled, 1-celled, 1-seeded. This species varies a good deal in the size of the flowers and leaves also in the amount of pubescence.

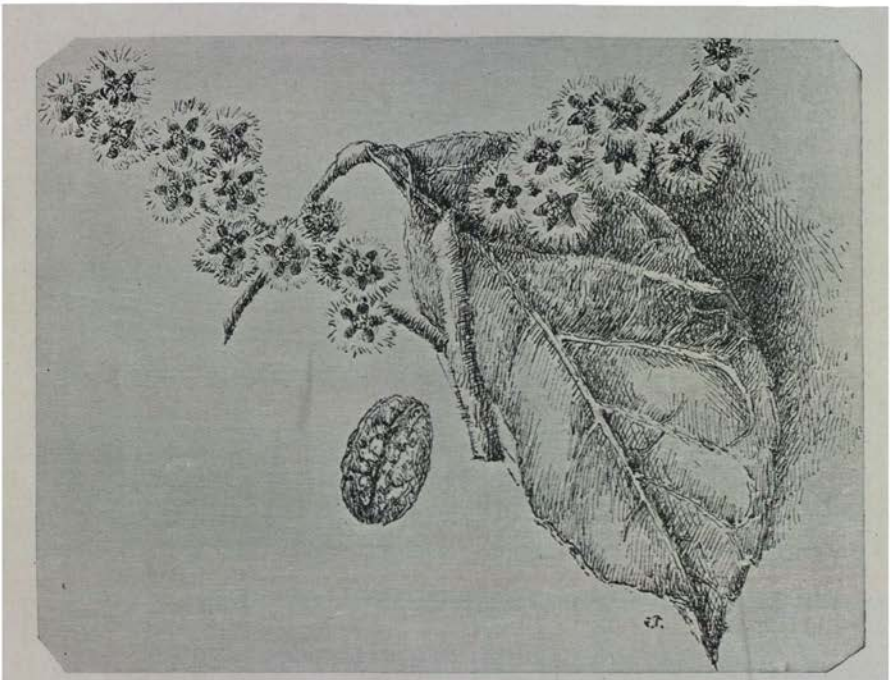


Fig 107. Elæocarpus oblongus, Gærtn.

Burma, Tenasserim, W. Peninsula, in the ghât evergreen rain-forests from the Konkan to Travancore, ascending to 2000′ in N. Kanara, in the Satara District, fairly common on the laterite at Mahableshwar and is found also at 5′-6000′ elevation in Mysore and on the Nilghiris. Fl. Mch.-June. Fr. Sept.-Oct. Wood white, strong and tough, adapted for the lathe. Bedd. The pericarp turns purple when cut and is sweet and edible when the fruit is ripe.

4. E. tuberculatus, Roxb. Fl. Ind. II, 594; Bedd. Fl. Sylv. t. cxiii; *Monocera tuberculata*, W. & A.; Dalz. & Gibs. Bomb. Fl. 27. *Bhutali*, K.

A large, rough-barked tree. Leaves crowded about the ends of the branchlets, obovate, obtuse, minutely serrulate, glabrous above, hairy on the nerves beneath; lateral-nerves about 12 pairs, prominent beneath; blade 8″-4″ by 3·5″-2·5″; petioles ·5″ long, stout. Flowers pure white, 1″ across, in copious racemes 4″-5″ long, aggregated just below the leaves and near the ends of the branches; buds bracteolate, pedicelled, rusty-tomentose, ovoid, 5-ribbed; bracteoles entire or variously toothed or lobed, inserted at the base of the pedicels. Sepals O or

obscurely ribbed within, grey-tomentose without, lanceolate, ·5″ long. Petals with a broad, bifid, shortly laciniate tip, silky-hairy on the back, glabrous inside except at the 2-glandular base. Stamens 70-80; filaments short, slender, dilated at the base; anthers linear, each with the outer valve long tailed; tails erect. Torus short, tomentose. Ovary conical, tomentose, 2-celled; cells with numerous ovules in two rows; style silky-hairy below, exceeding the stamens; stigma filiform. Fruit ovoid, smooth, 1·5″-2″ long; stone 2-valved, more or less laterally compressed, 1-2-seeded; sides deeply tubercled; margins thickened.

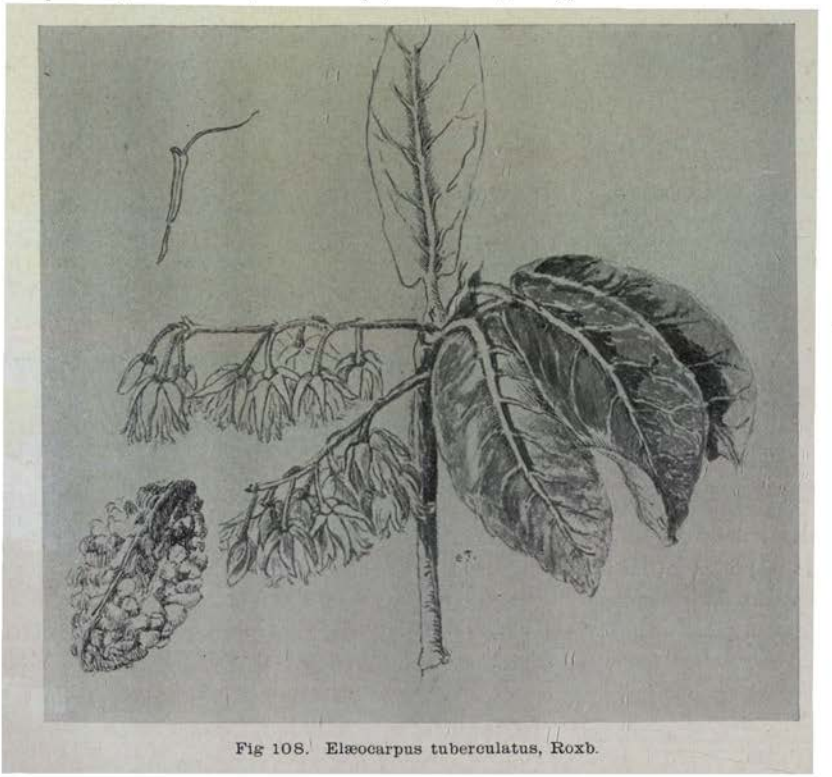


Fig 108. Elæocarpus tuberculatus, Roxb.

Western Peninsula on the Ghâts from N. Kanara southwards to Travancore; also in Burma and Java. A tall tree, 80′ high and 7′ in circumference, buttressed at the base. Bark dark-coloured, rough outside; inner-bark yellowish. Wood white or grey, compact, lustrous, smooth. Pores small, uniform, in short, radial lines or single. Medullary rays broad and fine, numerous. Annual-rings distinct. Weighs 42 lbs. to the cub. ft. Very handsome when in flower; common in the evergreen rain-forests near Mulamune on the Gairsoppah ghât.

The stones of the Kanara tree are much compressed and are, as far as I have observed, always 1-seeded. The separate tubercled valves are numerous on the ground under the trees in the cold weather; the fleshy epicarp having decayed during the rainy season. Flowers and young leaves appear from November till February. Fruit ripe during the rainy season. The tubercled nuts are made into rosaries and necklaces worn by Fakirs like those of *E. Ganitrus.*

E. aristatus, Roxb. Fl. Ind. 2, 559; Fl. Br. I 1 405.

This species is not mentioned by Beddome from Madras. The Konkan is quoted on the authority of Dr. Stocks in the Fl. Br. I. as one of the localities where it is found, but what part of the Konkan is not stated. It was included in my list of Bombay Trees published in 1894, erroneously as indigenous in N. Kanara. The other localities given as its habitat are Bhotan, Silhet and Assam.

5. E. Munroii, Mast. Fl. Br. I. 1, 407; *E. glandulifera,* Hook. f.; Bedd. Fl. Sylv. 38.

This handsome tree is found on the Nilghiris, also on the Bababuden hills of Mysore at about 5000′ elevation where I found it common in the sholas above Santaveri. It has however not, as far as I know, been recorded from the Bombay Presidency. The reflexed anther-tails and smooth olive-green fruit are good and distinctive characters. Fl. C. S. Fr. R. S.

Order XIX.—LINEÆ.

Herbs or shrubs. Leaves alternate, simple, entire. Inflorescence various. Flowers regular, bisexual. Sepals 5, free or connate below, imbricate. Petals 5, usually hypogynous, caducous, often contorted. Stamens 4-5 with as many staminodes or 8-10; filaments united at the base into a ring; anthers versatile; Glands 5, entire or 2-lobed, usually adnate to the staminal-ring or obsolete. Ovary entire, 3-5-celled; styles 3-5, free or more or less connate; stigmas terminal; ovules 1-2 in each cell, inserted in the inner angle, pendulous. Fruit usually splitting into 3-5 cocci, rarely a drupe. Seeds 1-2 in each cell; testa sometimes winged; albumen fleshy or O; embryo straight, rarely incurved; cotyledons broad; radicle superior.

An order of small interest to the forester, contains however the important economic species *Linum usitatissimum*, L. from which flax is obtained.

HUGONIA L.

Climbing, tomentose shrubs with woody tendrils. Leaves alternate, serrate, stipulate. Inflorescence of yellow flowers; lower peduncles converted into spiral hooks. Sepals 5. Petals 5. Stamens 10 with glandular swellings on the basal-ring between the filaments. Ovary 5-celled; styles 5, filiform; stigmas capitate; ovules 2, collateral in each cell. Drupe globose; seeds compressed, albuminous.

H. Mystax, Linn.; Fl. Br. I. 1, 413; Dalz. & Gibs. Bomb. Fl. 17; Cooke Fl. Pres. Bomb. 1, 156.

A large, much-branched, rambling shrub; branches, tendrils and sepals grey-tomentose. Leaves crowded at the ends of the branchlets, obovate or obovate-oblong, quite entire, glabrous, obtuse or subacute, reticulate on both surfaces; blade 1·5″-2·5″ by 1″-1·5″; petioles very short, hairy; stipules lanceolate-subulate. Flowers 1″-1·5″ in diameter, shortly pedicelled in the upper leaf-axils, yellow, rather showy. Sepals ·2″ long, ovate-lanceolate, acute, tomentose. Petals large ·6″ long, thin, oblong, acute or obtuse. Stamens alternately longer and shorter. Fruit globose, shorter than the persistent sepals, size of a large pea; stone bony, grooved 10-celled; cells 2-3-seeded.

Western Peninsula from the Konkan to Travancore. In the Bombay Presidency between Malvan and Vengurla. Fl. and Fr. Aug. Root with a yellowish bark, possessing an aromatic odour, used in native medicine in Malabar: Reede. Hort. Mal. 2. 19.

Erythroxylon monogynum, Roxb. *The Bastard Sandal wood tree* or *Red Cedar*, is common in the driest parts of the Madras Presidency. The leaves of this tree contain a bitter and tonic principle which certainly allays the pangs of hunger. They were greedily eaten by the starving natives during the famine of 1877 in the Madras Presidency.

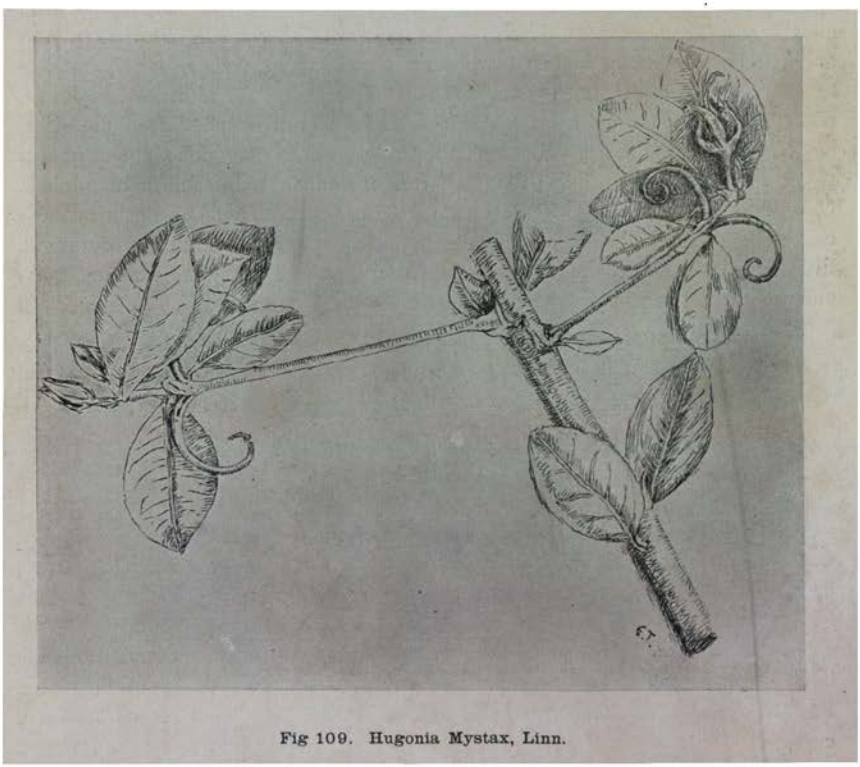


Fig 109. Hugonia Mystax, Linn.

Reinwardtia trigyna, Planch. *Abai*, Vern. is a tufted, glabrous undershrub with golden-yellow, handsome, polymorphic flowers and a small globose capsular fruit, commonly cultivated in gardens throughout the presidency, doubtfully indigenous.

Order XX.—MALPIGHIACEÆ.

Trees or shrubs, often climbing Leaves in the Indian genera opposite, entire; stipules small or O. Inflorescence axillary or terminal. Flowers pentamerous, regular or zygomorphic, bisexual; pedicels articulate, usually 2-bracteolate. Calyx 5-partite, 1 or more segments, never all, with sessile glands, rarely without glands *(Aspidopterys)*. Petals clawed or not, often fimbriate, imbricate. Disk obscure. Stamens 10, rarely fewer, hypogynous, equal or 1-2 much longer than the others; filaments free or connate below; anthers 2-lobed. Ovary 3-lobed, consisting of 3 carpels, more or less combined; ovules 1 in each carpel; styles 3, distinct or united; stigmas capitate, punctiform or lateral. Fruit of one or more winged samaras (Asiatic genera). Seeds exalbuminous; embryo curved or straight; radicle short, next the hilum; cotyledons foliaceous.

Petals clawed, unequal. Calycine-glands large.
Samaras winged at the ends ... ... 1. Hiptage.

Petals not clawed, equal. No calycine glands.
Samaras winged all round ... ... 2. Aspidopterys.

1. HIPTAGE, GÆRTN.

A climbing or sub-erect shrub. Leaves entire, opposite, coriaceous; stipules O. Flowers zygomorphic, white, fragrant, in terminal or axillary racemes; peduncles bracteate, articulate with the 2-bracteolate pedicels. Calyx 5-partite; glands large, adnate to the pedicel. Petals 5, clawed, unequal, fimbriate; 5th coloured. Stamens 10, 1 much longer than the others; filaments connate at the base. Ovary 3-lobed; lobes appendiculate; styles 1-2, circinate; stigmas capitate. Fruit of 1-3, 2-3-winged samaras. Seed subglobose; cotyledons thick, unequal, curved.

H. Madablota, Gærtn. Fruct. 2, 169, t. 116; Fl. Br. I. 1, 418; Dalz. & Gibs. Bomb. Fl. 33; Brandis For. Fl. 44; Gamble Ind. Timb. 118; *Banisteria bengalensis*, Linn.; *Gærtnera racemosa,* Roxb. Fl. Ind. 2, 368. *Haladwail*, M; *Bokhi, utimukta*, Vern.

A large woody climber. Leaves ovate-acuminate, oblong, acute at the base, coriaceous, shining above, paler beneath; blade 3″-6″ by 2″-3″; petioles ·25″ long. Flowers ·75″ across, white and yellow, fragrant, pedicellate; pedicels with 2 subulate bracts about the middle. Sepals obtuse, persistent; grey-tomentose outside; one with a large gland on the base outside. Petals unequal,

twice as long as the sepals, fimbriate; 5th petal yellow at the base. Ovary 3-lobed; style filiform; stigma capitate. Carpels 3; wings oblanceolate, unequal, longest 2·25″ by ·75″.

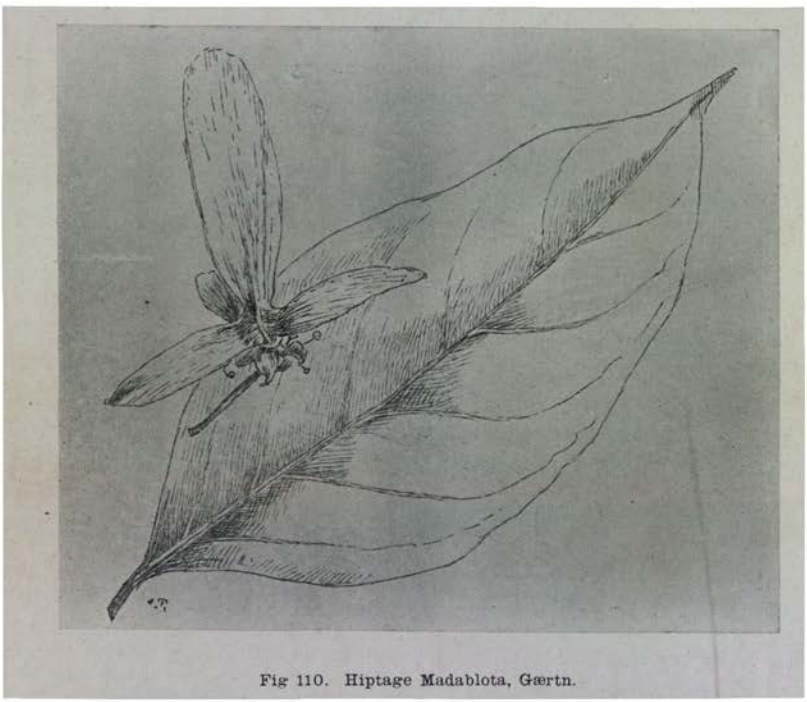


Fig 110. Hiptage Madablota, Gærtn.

Throughout the hotter parts of India from Sind to Burma and southwards to Ceylon; throughout the Bombay Presidency, near water-courses and in moist places. Fl. Fr. Jany.-Mch. A large, straggling climber often with thick stems. Bark brown, thin flakey. Wood red in the centre, moderately hard. Pores small to very large, irregularly distributed. Medullary rays numerous, moderately broad. Weighs about 35 lbs. to the cub. ft. Bark bitter, contains about 8 % of tannic acid.

2. ASPIDOPTERYS, A. Juss.

Climbing shrubs. Leaves opposite, entire, without stipules. Flowers small, regular, yellow or white, in simple or compound, axillary or terminal panicles; peduncles bracteate; pedicels jointed at the top, often minutely bracteolate. Calyx short, 5-partite, eglandular. Petals 5, equal, not clawed, quite entire.

Stamens 10, all perfect; filaments connate or distinct at the base. Ovary 3-lobed; sides winged; styles 3, glabrous; stigmas capitate. Fruit of 1-3 samaras; nucleus sometimes winged or crested at the back, surrounded with a broad oblong or orbicular, membranous wing. Seeds oblong, subterete; embryo straight; cotyledons equal; radicle short.

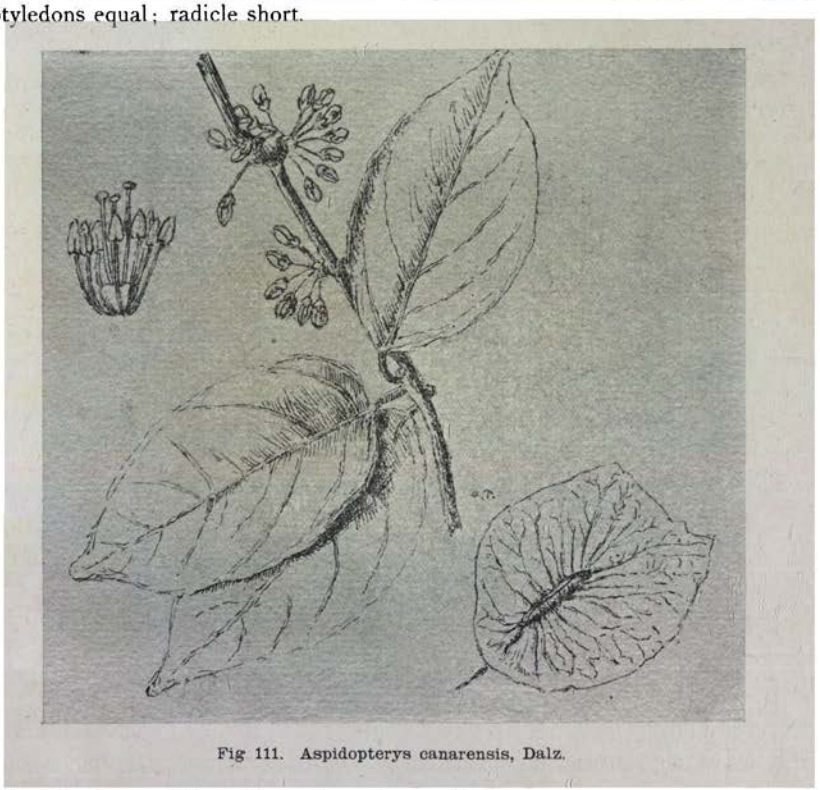


Fig 111. Aspidopterys canarensis, Dalz.

Panicles large, white or rusty-tomentose. Samaras without a winged-keel opposite the nucleus.

Leaves glabrous beneath. Samaras linear-oblong ... 1. A. Roxburghiana.

Leaves white-tomentose beneath. Samaras orbicular ... ... 2. A. cordata.

Flowers axillary, few-fascicled. Samaras dorsally winged, truncate or lobed at the apex ... ... 3. A. canarensis.

1. A. Roxburghiana, A. Juss. in Archiv. Mus. Hist. Nat. 3, 511; Fl. Br. I. 1, 420; Dalz. & Gibs. Bombay Fl. 33; Gamble Ind. Timb. 118; Brandis For. Fl. 45; *Hiræa indica,* Roxb. Fl. I. 2, 44.

A slender climber. Leaves ovate or elliptic-ovate, acuminate, acute or rounded at the base, slightly pubescent beneath when young, glabrous when old; blade 3″-4″ long, breadth variable; petioles ·25″-·5″ long. Panicles effuse, rusty-tomentose. Flowers ·17″ across; bracts lanceolate, pubescent. Calyx small; lobes ovate, obtuse, tomentose. Petals obovate, white. Ovary hairy. Samara linear, oblong; nucleus without a dorsal wing.

Sikkim Himalaya, Burma, W. Peninsula, Carnatic, Orissa and the Konkan, "Khandalla Ghâts and the Konkans," Dalz.; absent from N. Kanara. Gamble describes the bark as light-brown coloured and rough and the wood as yellowish-brown, soft and porous with concentric, pale, wavy bands across the medullary rays.

2. A. cordata, A. Juss. Archiv. Mus. Nat. Hist. 3, 513; Dalz. & Gibs. Bomb. Fl. 34; Fl. Br. I. 1, 421; Cooke Fl. Pres. Bomb. 1, 158.

A climbing shrub with rusty-pubescent, twining branches. Leaves orbicular or ovate, cordate, abruptly and broadly acuminate, glabrous above, white-tomentose beneath; blade 5″-8″ in diameter; petioles rusty-tomentose, 1″-1·5″ long. Inflorescence in lax, white or rusty-tomentose, axillary, cymose panicles; branches of panicle opposite each with 2 linear bracts 3″ long. Flowers bracteolate, ·25″ across; buds globose, glabrous. Calyx-lobes imbricate, glabrous. Petals oblong, twice as long as calyx-lobes. Stamens 10; filaments as long as the anthers, broader at the base, alternately longer and shorter. Ovary 3-celled, glabrous; styles 3, much longer than ovary; stigmas capitate. Samaras pale-red, orbicular, ·75″-1″ in diameter, veined, membranous and usually slightly keeled but without an accessary wing in the centre.

Western Peninsula, Konkan, Kanara and Mysore; common throughout the Konkan and North Kanara in moist monsoon-forests, also in the Deccan near Poona. Fl. Sept-Oct. Fr. C. S.

3. A. canarensis, Dalz. in Hook. Kew. Journ. Bot. III, 37; Fl. Br. I. 1, 420; Cooke Fl. Pres. Bomb. 1, 159.

A large climber with stout, tough, woody, twining branches. Leaves glabrous, elliptic, bluntly-acuminate; lateral-nerves 4 pairs; blade 3″-4″ by 1·5″-2″; petioles ·3″ long. Flowers small, white, ·2″ long in axillary 5-10-flowered fascicles on the old wood; pedicels slender, ·2″ long, bracteolate at the base on short, red-tomentose, bracteate peduncles. Calyx clothed with bright-red, short, shining hairs in bud subsequently glabrescent; lobes ovate, obtuse. Petals imbricate, hooded, oblong, white, 4 times as long as the calyx. Ovary glabrate; styles as long as or longer than the stamens; stigmas capitate. Samaras with a very membranous, brown, veined wing, lobed or truncate at the top, 1·5″ in dimeter; nucleus with a short, dorsal-wing ·5″ long by ·2″ broad.

Western Peninsula from N. Kanara to Malabar. In N. Kanara I have found it along the ghâts in evergreen, rain-forests from Diggi to Gairsoppah, but nowhere abundant. Fl. March. Fr. May. A very distinct species.

Order XXI.—GERANIACEÆ.

Herbs, rarely trees. Leaves opposite or alternate. Flowers hermaphrodite. Sepals 5, rarely 4 or more. Petals as many as the sepals or O. Torus with 5 glands alternating with the petals or eglandular. Stamens as many or double or treble as many as the sepals. Ovary of 3-5 carpels united with the axis as far as the insertion of the ovules, sometimes lengthened into a style or styles, free or united; ovules 1-2, rarely more. Fruit capsular or berried. Seeds pendulous or horizontal; albumen O; embryo straight or curved; cotyledons flat.

AVERRHOA, LINN.

Trees. Leaves alternate, imparipinnate. Flowers small, regular, in short panicles. Sepals 5, imbricate. Petals 5, hypogynous, contorted; glands O. Stamens 10, perfect, connected at the base into a short ring or 5 perfect and 5 staminodes. Ovary 5-lobed, 5-celled, without a beak; ovules many in the cells; styles 5, distinct; stigmas capitate. Berry oblong, 5-lobed. Seed with or without an arillus; albumen scanty; embryo straight.

Leaflets 5-11, glabrous and glaucous beneath.
Seeds arillate. ... ... 1. A. Carambola.

Leaflets 11-35, pubescent beneath. Seeds exarillate. ... ... 2. A. Bilimbi.

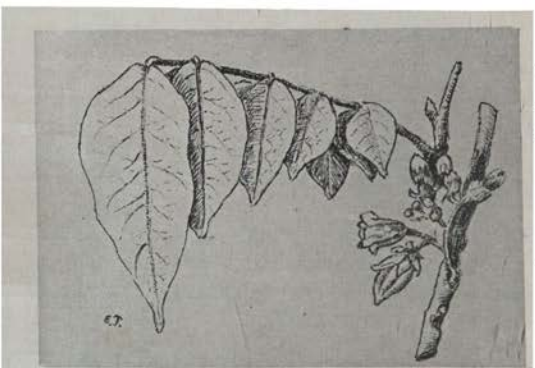


Fig 112. Averrhoa Carambola, Linn.

1. A. Carambola, Linn.; DC. Prodr. 1, 689; Fl. Br. I. 1, 439; Brandis For. Fl. 45; Bedd. Fl. Sylv. 39; Dalz. & Gibs. Bomb. Fl. Suppl. 16; Gamble Man. Ind. Timb. 118; Cooke Fl. Pres. Bomb. 1, 168. *Kamaranga,* Vern.

A small tree, with drooping branches. Leaflets 5-11, subopposite, rhomboidal, ovate-acute or acuminate, largest at the ends of the leaves, glaucous beneath, acute and oblique at the base, 3″-1″ by 1·75″-·5; petiolules very short.

Flowers ·20 across, in short axillary racemes, sometimes from the old wood. Sepals ·1″ long, broad-ovate, imbricate, glabrous. Petals longer than the sepals, contorted, purplish. Stamens 10, 5 shorter without anthers or sometimes longer and antheriferous ; filaments dilated at the base. Fruit obovoid, 3″ long with acute angles, yellow; funicles dilated into a bilabiate, cut, fleshy arillus.

In gardens throughout India. Cultivated throughout the Bombay Presidency; run wild in some of the forests near villages of North Kanara. Fl. H. and R. S. A small tree. Bark dark-coloured, horizontally wrinkled. Wood white, moderately hard and close-grained, weighs about 37 lbs. to the cub. ft. Ripe fruit made into jams and jellies and the astringent unripe fruit is used in dyeing.

2. A. Bilimbi, Linn.; DC. Prodr. 689 ; Fl. Br. I. 1, 439; Brandis For. Fl. 46; Bedd. Fl. Sylv. t. 117; Dalz. & Gibs. Bomb. Fl. Suppl. 16; Gamble Ind. Timb. 119; Cooke Fl. Pres Bomb. 1, 168. *Bilimbi,* Vern.

A small tree. Leaflets 6-14 pairs, lower smallest, sub-opposite, ovate-oblong, acuminate, unequal-sided at the base, glabrous, pubescent on the nerves beneath, pale beneath; blade 2″-·20″ by 1″-·15″; petiolules short. Flowers dark purple-brown, cauliflorous in short panicles from the old wood of the stem and branches; bracteoles subulate. Sepals ovate, glabrescent or with a few shining hairs. Petals much longer than the sepals, pubescent. Fruit oblong, slightly furrowed, 2″ long, obtusely lobed, yellow; seeds without an arillus.

In gardens throughout India ; cultivated in the Konkan and North Kanara. Fl. H. S. Fr. R. S. A small tree. Wood white, tough and even-grained; weighs 35 lbs. to the cub. ft. The acid fruit is pickled and the juice removes iron-mould stains from linen.

Order XXII.—RUTACEÆ.

Trees or shrubs often spinous or prickly. Leaves dotted with aromatic, pellucid glands, opposite or alternate, simple or compound, exstipulate. Flowers in axillary or terminal cymes or panicles, regular usually bisexual, Sepals and petals 4-5 each. Stamens 4-5 or 8-10, rarely more ; filaments usually free ; anthers 2-celled, introrse. Disk crenate or lobed, cylindrical, annular or elongated between the stamens and the ovary. Ovary of 4-5 carpels ; styles as many, free or united ; stigmas entire or lobed ; ovules 2 or more in each cell. Fruit various ; albumen fleshy or O; embryo large, cotyledons fleshy or foliaceous; radicle superior. A large order of mostly aromatic plants containing the orange, lemon and other common fruit trees.

Flowers usually polygamous. Ovary deeply 2-5-lobed ; cells 2-ovuled ; styles more or less free. Carpels dehiscent. (*Zanthoxyleæ*)

Leaves opposite, trifoliate. An unarmed tree.... 1. Evodia.

Leaves alternate, trifoliate or pinnate. Prickly trees or shrubs .... 2. Zanthoxylum

Flowers usually polygamous. Ovary entire ; cells 1-2-ovuled; style single. Fruit not dehiscent ; seeds albuminous. (*Toddalieæ.*)

Leaves trifoliate. Prickly climbers ... ... 3. Toddalia.

Leaves simple. Unarmed erect trees or shrubs 4. Acronychia.

Flowers hermaphrodite. Ovary entire; cells 1-many-ovuled ; style simple. Fruit a pulpy berry; seeds exalbuminous. Mostly spinous trees or shrubs (*Aurantieæ*)

Style very short, persistent ... ... 5. Glycosmis

Style deciduous, jointed at the base.

Leaves trifoliate or pinnate.

Ovules 2 in each cell.

Unarmed, erect shrubs or trees.

Filaments linear-subulate ... ... 6. Murraya.

Filaments dilated at the base ... 7. Clausena.

Climbing shrubs, usually armed ... 8. Luvunga.

Ovules solitary in the cells.

Calyx 3-lobed. Stamens 6. Leaves trifoliate ... ... 9. Triphasia.

Calyx 4-5-lobed or parted. Stamens 8-10. Leaves pinnate ... ... 10. Limonia.

Leaves 1-foliate or simple.

Calyx cupular. Disk elongate.. ... ... 11. Paramignya.

Calyx 3-5-lobed or parted. Disk cupular. ... 12. Atalantia.

Ovules many in each cell.

Leaves 1-foliate. Fruit with a soft epicarp 13. Citrus.

Leaves pinnate. Fruit with a woody epicarp 14. Feronia.

Leaves trifoliate. Fruit with a woody epicarp 15. Ægle.

I. EVODIA. Forst.

Unarmed shrubs or trees. Leaves 1-3-foliate, glabrous. Flowers small unisexual, in axillary cymes. Sepals 4-5. Petals 4-5. Stamens 4-5, inserted at base of disk; filaments subulate; anthers oblong. Disk sinuate. Ovary pubescent, 4-5-lobed, 4-5-celled; cells 2-ovuled; stigma 4-lobed. Fruit capsular consisting of 4, coriaceous, 3-valved, 1-seeded cocci; endocarp horny, elastically separable, 2-lobed. Seeds oblong; testa crustaceous; albumen fleshy; embryo straight; cotyledons ovate.

E. Roxburghiana, Benth. Fl. Hongk. 59; Fl. Br. I. 1, 487; Gamble Ind. Timb. 120; Cooke Fl. Pres. Bomb. 1, 177; *E. triphylla*, Bedd. Fl. Sylv. Anal. Gen. XLI. t. 6. f. 2; *Xanthoxylon triphyllum,* Dalz. & Gibs. Bomb. Fl. 45. *Kabale*, K.

A small tree; young parts tomentose. Leaves opposite, trifoliate, quite glabrous; leaflets shining above, ovate, obovate or oblanceolate, shortly petioluled; rounded or acuminate at the apex; narrowed into the petiolule at the base; blade 7″-4″ by 3″-2″; petioles 2″-5″ long; lateral-nerves up to 20 pairs, prominent. Cymes very variable, more or less finely pubescent; branches opposite and alternate; bracts minute. Flowers diœcious, densely crowded, yellowish-green, about ·12″ across. Calyx minute. Petals yellowish-white, slightly imbricate. Male fl.: Stamens 4; filaments glabrous; anthers white, versatile. Disk pulvinate, tomentose. Fem. fl.: Ovary densely pubescent; style short thick; stigmas 4; staminodes 4 with effete anthers. Capsule obovate, size of a pea, coriaceous, glabrous, 2-valved; seeds black, shining.

Khasia mountains, E. & W. Peninsulas and Ceylon; throughout the Konkan and N. Kanara ghâts, in moist situations from the sea-level up to 4000′ elevation, in both rain and deciduous monsoon-forests. Flowers and fruits usually during

the hot season about March; also during the rainy season, (Sept.) "Wood greyish-brown, moderately hard; weighs 51 lbs. to the cub. ft." Gamble. The size of the leaflets varies considerably; the N. Kanara tree having usually larger leaflets on shorter petiolules than those from the Konkan ghâts and Malay Archipelago.

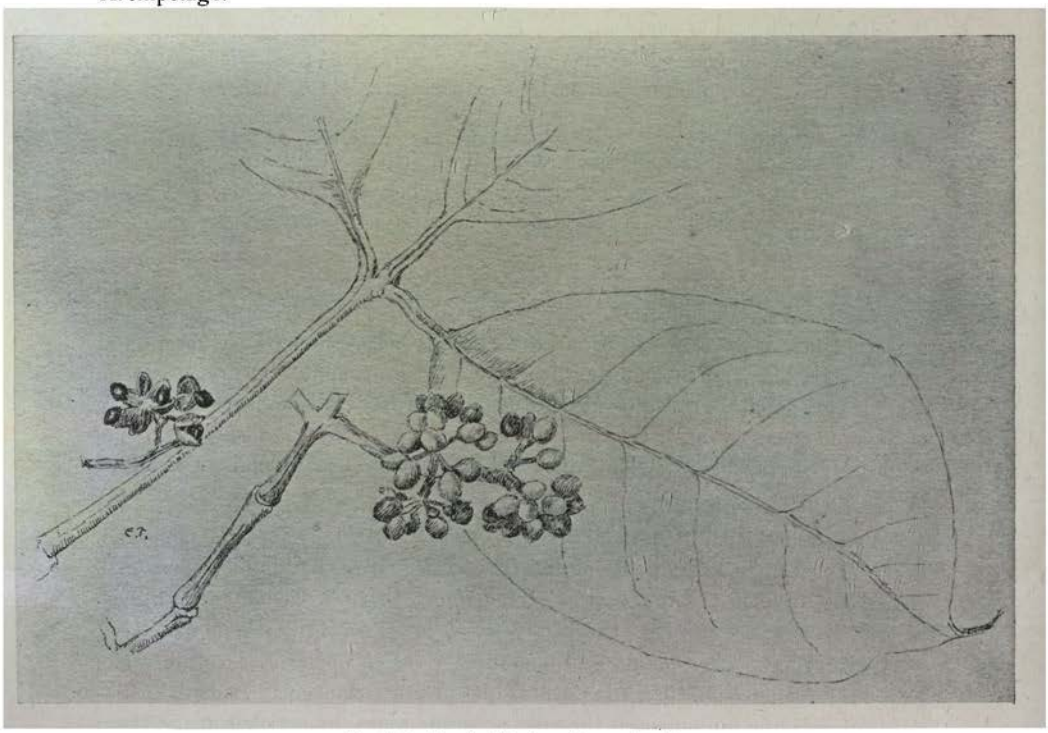


Fig 113. Evodia Roxburghiana, Benth.

2. ZANTHOXYLUM, Linn.

Trees or scandent shrubs, often prickly. Leaves alternate, with the leaflets often oblique, pellucid-punctate, entire or crenate. Flowers small, often unisexual, in axillary or terminal cymes. Calyx 3-8-fid, rarely O. Petals 3-5, rarely O. Disk small or obscure. Stamens 3-5, hypogynous or reduced to scales in the fem. fl. Ovary rudimentary in the male, of 1-5, oblique carpels in the female flower; styles sublateral, free or connate above; stigmas capitate; ovules 2 in each cell. Fruit of 1-5 globose, 1-seeded, ventrally dehiscent carpels. Seeds oblong or globose, often hanging out of the ripe open carpels; testa black shining; albumen fleshy; embryo axile; cotyledons flat; radicle very short.

Leaves trifoliate. Cymes axillary. Shrub. ... 1. Z. ovalifolium.
Leaflets 8-20-pairs. Cymes terminal. Tree. ... 2. Z. Rhetsa.

1. Z. ovalifolium, Wgt. Ill. 169; Fl. Br. I. 1, 492; Bedd. Fl. Sylv. Anal. Gen. 42; Cooke Fl. Pres. Bomb. 1, 178; Gamble. Ind. Timb. 121. *Armadal, armadalu,* K. *Armarlu,* Kon.

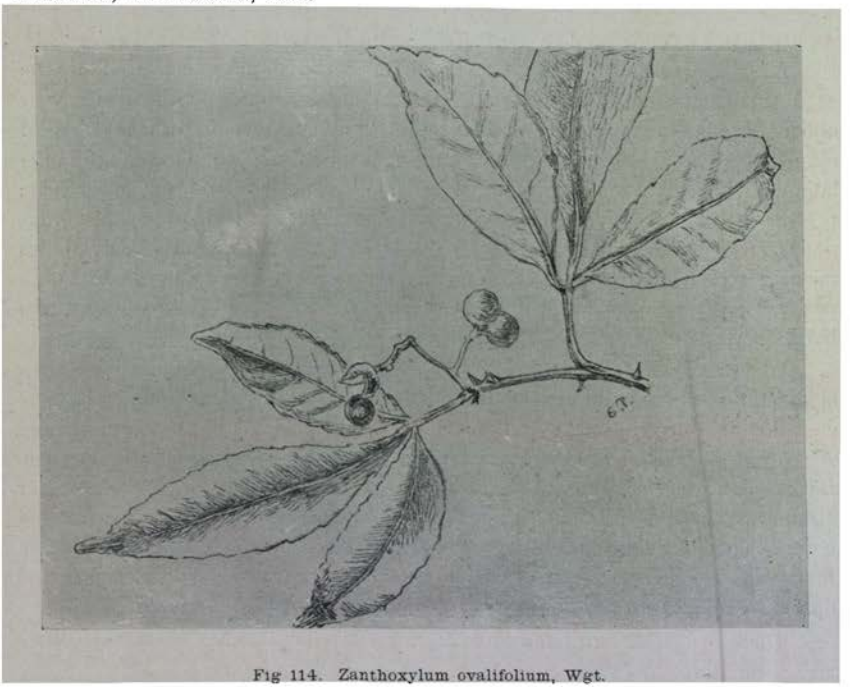


Fig 114. Zanthoxylum ovalifolium, Wgt.

A large, glabrous shrub or small tree. Leaves 1-3-foliate, stoutly petioled; leaflets coriaceous, elliptic-oblong or obovate, crenulate, obtusely acuminate, emarginate subsessile; blade 3″-4″ by 1″-2″; petioles ·75″-1·25″ long. Flowers glabrous, in slender, panicled, puberulous, terminal cymes 3″-4″ long; buds globose or obovoid, ·1″ in diameter; pedicels as long as the buds. Calyx minute, 5-lobed. Petals white, valvate, ·1″ long, reflexed. Stamens: filaments alternate with the petals, flat; anthers 2-celled, white; cells 3-lobed; style short, conic. Fruit size of a pea, glandular-pitted, 2-valved, red-coloured; seed exserted when ripe; testa black.

Khasia mountains, E. & W. Peninsulas, Assam and the Mishmi mountains; common in the rain-forests of the Sirsi and Siddapore sub-divisions of N. Kanara. Flowers during Feb.-Mar. Fruit ripe cold season. A large, erect

shrub; branches covered with white lenticels. Bark smooth, greenish-brown, covered with scattered, short, straight prickles, springing from a broad base; inner-bark whitish. Wood hard, white. Fruit used in curries.

2. Z. Rhetsa, DC. Prodr. 1, 728; Fl. Br. I. 1, 495; Dalz. & Gibs. Bomb. Fl. 45; Bedd. Fl. Sylv. Anal. Gen. 41; Cooke Fl. Pres. Bomb. 1, 178; Gamble Ind. Timb. 123; *Tirphal, thriphal, tisul, cochli,* M.; *Jummina, sessal,* K.; *Pepuli,* H.

A large, deciduous tree. Leaves pinnate, 1′-1·5′ long, clustered at the ends of the branches; leaflets 8-20 pairs, thin, membranous, opposite, ovate, very oblique, caudate-acuminate, glabrous, entire or crenate-serrate, with large, raised glands in each of the crenelures; blade 3″-5″ by 1·25″-2″; petiolules ·25″ long; lateral-nerves 10-12 on the upper side of the leaflet, fewer on the lower side; petioles 1″-3″ long. Cymes large, terminal; branches angled, opposite; bracteoles very small, caducous. Flowers yellow, ·2″ across, 4-merous. Calyx-lobes minute, triangular. Petals ·1″ long, ovate, valvate, yellow. Carpels size of a pea, red, rugose, dehiscent at the top; seeds blue-black, subglobose; episperm hard, stony.

Western Peninsula from the Konkan southwards. In N. Kanara it is found in some of the evergreen monsoon-forests from the coast inland and up to 2000′ elevation. Flowers from July till November. Fruit ripe during the cold season. A large or medium-sized tree, attains a height of 60′-70′ and 4′-5′ in girth. Bark thick, yellowish, corky, deeply fissured and covered with large curved or straight prickles, each on a solid, conical base. Wood yellowish, compact and close-grained. Pores small, single or in rows of 3-5, uniform. Medullary rays fine, numerous, long or short. Annual-rings distinct. Autumn-wood denser and darker in colour with few pores. Weighs about 40 lbs. to the cub. ft.

The essential oil extracted from the carpels is used in native medicine. The ripe seeds which taste like pepper are used in making pickles.

3. TODDALIA, Juss.

Rambling prickly shrubs or trees. Leaves alternate, 1-3-foliate; leaflets sessile. Flowers small, unisexual, in axillary or terminal cymes or panicles. Calyx 2-5-lobed. Petals 2-5. Disk inconspicuous, short or elongate. Stamens 2-4-5 or 8 with the alternate imperfect, inserted at the base of the disk. Ovary entire or 4-parted in the male flowers, in the female flowers 2-7 rarely 1-celled; ovules 2 in each cell. Fruit gland-dotted, 2-7-celled. Seeds angled, reniform; albumen fleshy; embryo curved, terete; cotyledons linear or oblong.

Prickly shrubs.	Petals 5	1. T. aculeata.
Unarmed trees.	Petals 2-3 ...	2. T. bilocularis.

1. T. aculeata, Pers.; DC. Prodr. 2, 83; Fl. Br. I. 1, 497; Dalz. & Gibs. Bomb. Fl. 46; Bedd. Fl. Sylv. 42; Cooke Fl. Pres. Bomb. 1, 179; Gamble Ind. Timb. 123; *Limonia oligandra*, Dalz. & Gibs. Bomb. Fl. 28. *Jungly kalimirchi, manger, limri,* M.; *Pargi-halli*, K. *The Lopez Root.*

Fig 115. Toddalia aculeata, Pers.

A scandent or sarmentose shrub. Leaves glabrous, alternate, trifoliate; petioles 2″ long; leaflets sessile, elliptic, or obovate, crenulate, acute, obtuse or notched at the apex, coriaceous; blade 1″-4″ by ·5″-2″. Cymes axillary, longer or shorter than the leaves. Flowers small, ·2″ in diameter, white, pentamerous. Calyx glandular. Petals imbricate. Stamens spreading, exserted. Ovary 5-celled; cells 2-ovuled; style short or 0; stigma capitate. Fruit indehiscent, size of a large pea, orange-coloured, grooved and conspicuously dotted; seeds 3-5.

Sub-tropical Himalayas, ascending to 5000′, Khasia mountains ascending to 6000′; Western Peninsula, common throughout the ghâts of the Bombay Presidency in rain-forests. Fl. Aug.-Jan. Fr. R.S. Stem 2·5″-4″ in diameter at the base. Bark yellowish, corky, but not fissured, covered with conical prickles 1″ high, each from a broad base and consisting of alternate plates of corky periderm and woody phlœm, crowned by a hard curved prickle (the original prickle) which falls off eventually; inner-bark of red and yellow tissue in concentric layers; yellow thicker and harder than the red. Wood porous, yellowish-white, soft. The ripe berries are pickled. A valuable medicinal product, equal in some cases to quinine, is obtained from the roots. Not an erect shrub as stated by Dalzell in the Bo. Fl. p. 46.

2. T. bilocularis, W. & A. Prodr. 149; Fl. Br. I. 1, 497; Cooke Fl. Pres. Bomb. 1, 180; Bedd. Fl. Sylv. 43. Ic. t. 167; *Dipetalum biloculare*, Dalz. & Gibs. Bomb. Fl. 46.

A small or middle-sized, unarmed tree with dense, dark-green foliage. Leaves 12″-14″, long; leaflets 3, elliptic-lanceolate, acuminate, quite entire, tip notched; blade 6″-10″ by 2″-3·75″; nervation prominent, looped within the margin; petioles 3″-4″ long. Inflorescence terminal or from the upper leaf-axils. Calyx cupular. Petals 2-3 usually 2. Stamens 6. Stigma large, peltate. Fruit size of cherry, 2-celled, pellucid-punctate.

Western Peninsula, Konkan, Kanara and the Anamullays from 2-4000′, in moist forests. Fl. March. 'This is a very rare species in the Bombay Presidency and has only been found hitherto by Dalzell in the N. Kanara district.

4. ACRONYCHIA, Forst.

Trees. Leaves subopposite, usually simple, entire. Flowers axillary, cymose. Calyx minute, 4-lobed. Petals 4, spreading, revolute. Disk thick, 8-angled, pubescent. Stamens 8, alternate, longer. Ovary tomentose, in the hollow tip of the disk, 4-celled; style terminal; stigma 4-grooved; ovules 2, superposed in each cell. Fruit a 3-5-celled drupe, or a 4-valved, loculicidal capsule. Seeds often exserted and pendulous from a slender funicle; testa black; albumen copious; embryo straight; cotyledons oblong, flat.

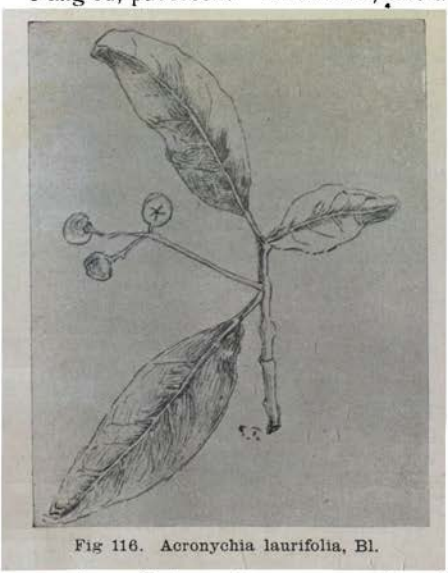


Fig 116. Acronychia laurifolia, Bl.

A. laurifolia, Bl. Bijd. 245; Fl. Br. I. 1, 498; *A. pedunculata*, Bedd. Fl. Sylv. 42; Cooke Fl. Pres. Bomb. 1, 180; Gamble Ind. Timb. 124; *Cyminosma pedunculata,* DC.; Dalz. & Gibs. Bomb. Fl. Suppl. 17; Grah. Cat. Bo. Pl. 36; *Clausena simplicifolia,* Dalz. & Gibs. Bomb. Fl. 30. *Bhutali, sonemau,* K.

A small tree. Leaves opposite, elliptic-lanceolate, entire, glabrous, 4″-5″ by 1·5″-2″; petioles 1″-1·5″ long. Cymes axillary, near the ends of the branches, corymbose, long-peduncled. Flowers fragrant, yellowish. Sepals ovate, very small. Petals villous within, ·25″ long, strap-shaped, revolute, valvate. Fila-

ments dilated at the base, inserted outside the yellowish, 8-angled disk; anthers versatile. Ovary conical, softly villous, 3-5-celled; style short; stigma capitate. Drupe size of a pea, rough with sunken glands and with a pyramidal, grooved tip; seed with a crustaceous, black testa.

Widely spread throughout the tropics of the old world, ascending to 4000′ in the Himalayas. In monsoon and rain-forests on the North Kanara ghâts; common on the hills near Karwar at about 1000′ elevation. Flowers during August. Fruit ripe in Nov.-Jan.

A small or moderate-sized tree. Bark grey, smooth, with a thin outer corky layer; inner-bark brown with lines of white tissue. "Wood white, smooth, soft to moderately-hard. Pores moderate-sized, subdivided, irregularly distributed in concentric groups. Medullary rays fine, irregularly spaced, not numerous. The leaves and bark are used in medicine" Gamble.

5. GLYCOSMIS, Correa.

Shrubs or trees. Leaves alternate, 1-5-foliate; leaflets polymorphous, alternate. Flowers small, usually in axillary panicles. Calyx 4-5-partite. Petals 4-5, imbricate: Stamens 8-10, free, inserted round a disk; anthers often with an apical or dorsal gland. Ovary 2-5-celled; style short, persistent. Berry white, fleshy, 1-3-seeded; seeds oblong; testa membranous; cotyledons equal; radicle very short.

G. pentaphylla, Corr. in Ann. Mus. VI, 384; Fl. Br. I. 1, 499; Dalz. & Gibs. Bomb. Fl. 29; Brandis For. Fl. 49; Bedd. Fl. Sylv. 43; Cooke Fl. Pres. Bomb. 1, 181; Gamble Ind. Timb. 125. *Kirmira*, Vern. *Manikyan*, K.

A large, evergreen shrub or small tree. Leaflets 3-7, elliptic-lanceolate, 1″-9″ by ·25″-3,″ entire or dentate; petioles variable in length, ·5″-2″ long. Flowers small, white, pubescent, in densely-flowered, erect panicles; bracteoles very small, triangular. Calyx-lobes ovate; margins membranous. Petals imbricate, white, ovate, orbicular, ·15″ long. Stamens with the filaments alternately shorter and longer and broadening upwards; anthers 2-celled, glandular at the apex. Ovary on a short, thick disk, covered with white, raised glands; style short, persistent not articulated. Berry white or pink, fleshy, globose, depressed, apiculate, variable in size, usually about that of a small cherry.

Tropical and sub-tropical Himalaya, ascending to 7000′, Assam, E. and W. Peninsulas, Malacca, China and Ceylon, extends to the Malay Archipelago and Australia; very common in the undergrowth throughout the monsoon-forests of the Konkan and N. Kanara, often near streams and water-courses, also in mango topes and other moist, shady localities near villages. Flowers throughout the year. A shrub usually with few branches. Bark light-grey or yellowish.

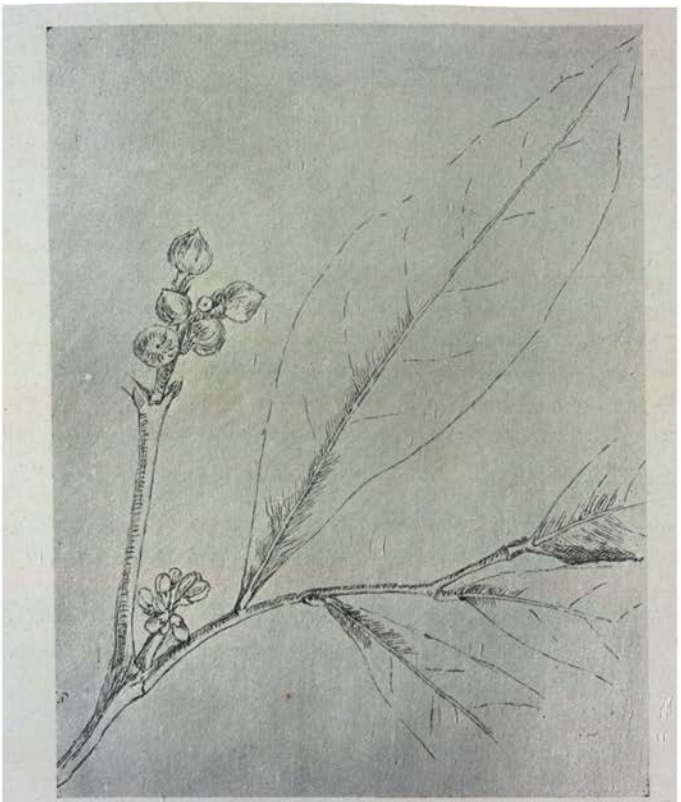


Fig 117. Glycosmis pentaphylla, Corr.

Wood hard, close-grained. Sharp concentric prominent white lines cross the fine and very numerous, wavy medullary rays. Pores small sub-divided or in radial lines.

6. MURRAYA, Linn.

Unarmed shrubs or small trees. Leaves alternate, pinnate. Flowers solitary, in terminal corymbs or axillary cymes. Calyx 5-divided. Petals 5, imbricate, free. Stamens 10, inserted around an elongated disk; filaments alternately shorter; anthers small, short. Ovary 2-5-celled, seated on the disk; ovules solitary or 2, superimposed or collateral in each cell; style elongate, deciduous; stigma capitate, Berry 1-2-seeded. Seeds with a woolly or glabrous testa, exalbuminous; cotyledons equal.

Leaves 3-8-foliate. Corymbs few-flowered. ... ... 1. M. exotica.

Leaves 10-20-foliate. Corymbs many-flowered. ... 2. M. Kœnigii.

1. M. exotica, Linn.; Fl. Br. I. 1, 502; Bedd. Fl. Sylv. 44; Brandis For. Fl. 48; Cooke Fl. Pres. Bomb. 1, 182; Gamble Ind. Timb. 125, *M. paniculata,* Jack; Dalz. & Gibs. Bomb. Fl. 29; *Kunli, chalajuti, marchulajuti,* Vern.; *Pandry,* K.

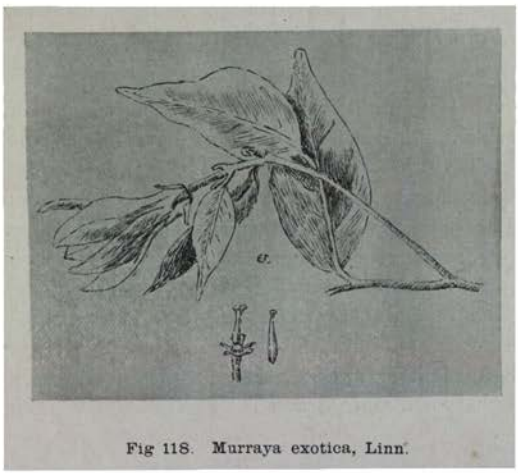


Fig 118. Murraya exotica, Linn.

A small, evergreen tree or large shrub with grey bark; young parts pubescent. Leaves 4″-5″ long; leaflets ovate or obovate, often rhomboid, glabrous, shortly petioluled, obtuse or bluntly acuminate, often emarginate; 3″-1·5″ by 1·5″-·75″. Flowers white, fragrant, in terminal, sessile, corymbose cymes. Sepals small, glandular, acute. Petals white, gland-dotted, ·5″-·75″ long, erect, spreading above. Filaments flat, linear, subulate. Ovary seated on a short, columnar disk, glabrous, 2-celled, 2-seeded; stigmas sessile. Berry ·5″, long, globose, usually 2-seeded, red when ripe.

Throughout the hotter parts of India, Ceylon, China, Australia and the Pacific Islands. In the evergreen rain-forests of the Konkan and N. Kanara ghâts. Three varieties are given in the Fl. Br. I. Var. 1; a shrub with many-flowered corymbs usually cultivated in gardens on the Bombay side; is common in N. India. Var. 2; arboreous with few-flowered corymbs or the flowers subsolitary; is the W. Peninsular form, gregarious in some of the N. Kanara rain-forests. Var. 3; from Trincomalee in Ceylon has the ovary 4-5-celled as a distinguishing character. Varieties 1 and 2 having the ovaries 2-celled.

A shrub or small tree. Bark thin, smooth, yellowish. Wood similar in structure to that of *M. Kœnigii,* light-yellow, close-grained, very hard; resembles boxwood; weighs 62 lbs. to the cub.-ft.; used for walking sticks, tool-handles etc.

2. M. Kœnigii, Spreng. Syst. Veg. II, 315; Fl. Br. I. 1, 502; Bedd. Fl. Sylv. 44; Brandis For. Fl. 48; Cooke Fl. Pres. Bomb. 1, 182; Gamble Ind. Timb.

126; *Bergera Kœnigii*, Dalz. & Gibs. Bomb. Fl. 29. *Karhi-nimb*, *kudia-nim*, *poospala*, M.; *Karhepah*, *gandla*, Vern. *Kuri-bevu*, K.; *The Curry-leaf Tree*.

A large shrub or small tree, pubescent or tomentose, rarely glabrous. Leaves deciduous, 10-20-foliate, about 1′ long; petioles slender, ·75″ long; leaflets obliquely ovate, obtusely acuminate, tip emarginate, crenulate, thin, 1″-1·5″ by ·5″-·75″; petiolules ·25″ long. Flowers small, in terminal, corymbiform panicles. Calyx-lobes triangular. Petals linear, oblong. Stamens alternately long and short; filaments dilated below. Ovary 2-celled; style cylindric; stigma capitate, grooved. Fruit ·3″ in diameter, ovoid, black, rugose, usually 2-seeded; seeds imbedded in acrid mucilage.

Himalayas ascending to 5000′, Bengal, Assam, Upper and Lower Burmah W. Peninsula from the Konkan southwards, often cultivated; common in the monsoon-forests of the Konkan and North Kanara; forms a large proportion of the undergrowth in some of the deciduous forests of the Supa sub-division of North Kanara. Flowers during the hot season. Fruit ripens during the rainy season. A small tree with a strong, peculiar, aromatic odour. Stems 12′-15′ high and 6″ in diameter. Bark grey with shallow fissures. Wood yellowish-white, hard, close-grained, durable. Pores small, in groups or lines between the fine medullary rays which are crossed by fine sharply defined, white, concentric lines. Weighs about 50 lbs. to the cub.-ft. Made into agricultural implements. Leaves used for flavouring curries. The bark and root, as well as the leaves, are used in native medicine.

7. CLAUSENA, Burm.

Aromatic, glandular, unarmed shrubs or trees. Leaves alternate, imparipinnate. Flowers small, bisexual, in terminal or axillary cymes. Calyx 4-5-toothed or lobed. Petals 4-5, membranous, slightly imbricate. Stamens 8-10, free, inserted round the disk, alternate shorter; filaments dilated or arched and concave below the subulate tip; anthers 2-celled, ovate. Ovary stipitate, 4-5-celled; cells 2-ovuled; ovules collateral or superposed; style at length deciduous. Fruit a small, 1-5-celled and seeded berry; seeds oblong; cotyledons equal, plano-convex.

Inflorescence in terminal panicles ... ... 1. C. indica.
Inflorescence in axillary, cymose panicles or racemes ... 2. C. Willdenovii.

1. C. indica, Oliv. in Jour. Linn. Soc. V. Suppl. II, 36; Fl. Br. I. 1, 505; Bedd. Fl. Sylv. 45; Cooke Fl. Pres. Bomb. 1, 183; *Piptostylis indica*, Dalz. & Gibs. Bomb. Fl. 29.

A shrub or small tree; branches, petioles, etc. puberulous. Leaves 4″-10″ long with slender glabrous petioles; leaflets 7-11, alternate, glabrous, with

raised glands on both surfaces, crenulate, oblique-rhomboid, obtusely acuminate and emarginate at the apex, shortly petioluled, subcoriaceous, 2″-4″ by 1′-2″; petiolules ·25″ long. Flowers small, 5-merous, in peduncled, corymbose panicles; pedicels short. Sepals ovate, acute, ciliolate on the margins. Petals ·10″ long, broadly ovate. Filaments broad, as long as or longer than the versatile anthers. Ovary globose, usually 3-celled, glabrous, glandular, verrucose; cells 2-ovuled; ovules collateral; style short, stout. Fruit tubercled when young, globose, ·5″ in diameter, yellow, pulpy.

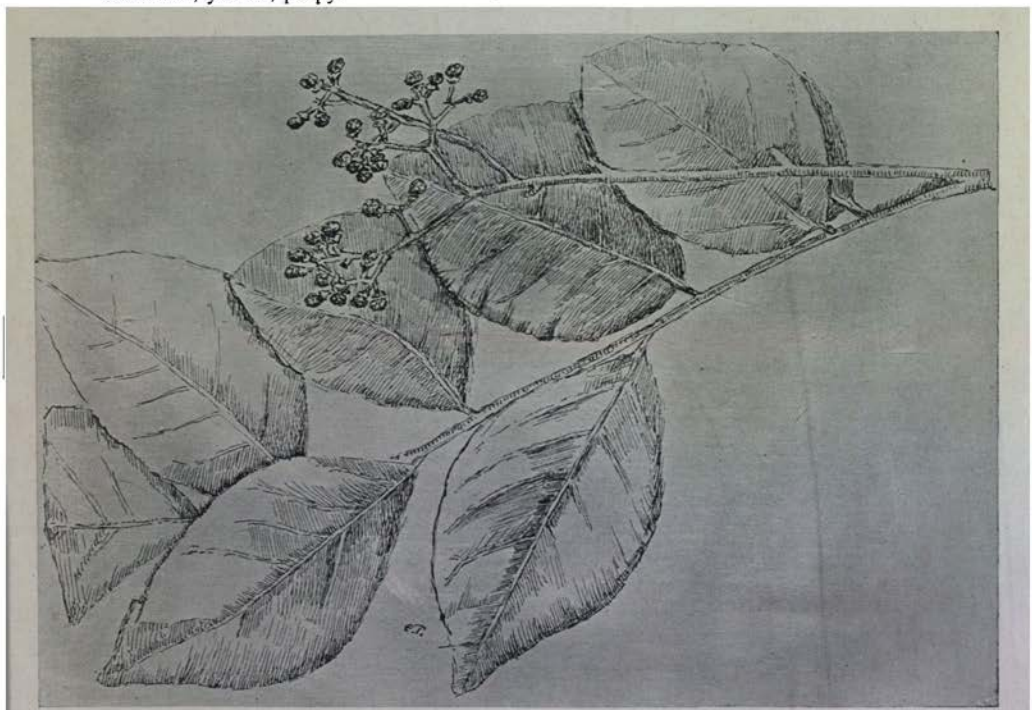


Fig 119. Clausena indica, Oliv.

Western Peninsula from the Konkan to the Anamullays, Ceylon; common in evergreen rain-forest on the ghâts of North Kanara from Ainshi southwards, (Parwar Ghât, Dalz.). Flowers April-May. Fruit ripens during the rainy season, edible. "Wood close-grained and hard, adapted for the lathe." Gamble.

2. C. Willdenovii, W. & A. Prodr. 96; Fl. Br I. 1, 506; Bedd. Fl. Sylv. 44; Dalz. & Gibs. Bomb. Fl. 30; Cooke Fl. Pres. Bomb. 1, 183; Gamble Ind. Timb. 127; *Cookia dulcis*, Bedd. in Madras Jour. 1861.

A small, deciduous tree; young parts mealy-pubescent or tomentose. Leaves about 1′ long, 5-13-foliate; leaflets membranous, 1″-4″ by ·5″-2″ obliquely-ovate, caudate-acuminate, crenulate, very erose towards the apex; nerves slender, conspicuous; petiolules ·12″-·25″ long, distinct. Panicles or racemes axillary, cymose, appearing with the young leaves and shorter than them. Flowers bracteolate, fragrant, white; pedicels short, ·25″ long; bracteoles linear, tomentose, caducous. Calyx 4-lobed. Petals 4, glandular, deciduous. Filaments broad, narrowed upwards; anthers short, cordate. Disk short, columnar. Ovary globose, 4-celled; ovules 2 in each cell, obliquely superposed; style deciduous; stigma slightly 4-lobed. Fruit globose, size of a small cherry, white, succulent when ripe, deeply gland-pitted when dry, edible.

Sikkim Himalaya, 1-2000′, W. Peninsula from the Konkan southwards; abundant on some of the Belgaum and N. Kanara ghâts in rain-forest. Fl. Feb.-May. Fr. ripe from June onwards. Beddome describes the fruit of *Cookia dulcis*, "As large as a large cherry, as succulent as a grape and somewhat of the flavour of the black currant." The cultivated *Cookia dulcis*, Bedd. was reduced to a variety of *C. Willdenovii*, W. & A. (Var. *dulcis*) by the late Professor Oliver but Col. Beddome considered it distinct. The fruit of the wild plant does not appear to be particularly palatable.

8. LUVUNGA, HAMILT.

Climbing spinous shrubs. Leaves trifoliate. Flowers in axillary, fascicled or panicled racemes. Calyx cupular, entire or obscurely 4-6-lobed. Petals 4-5, free, thick, imbricate. Stamens 8-10, inserted around a cupular disk; filaments free or connate. Ovary 2-4-celled; ovules 2 in each cell; style ultimately deciduous; stigma capitate. Berry ellipsoid; rind thick, tubercled. Seeds ovoid; testa membranous, nerved; cotyledons equal, oblong, fleshy.

L. eleutherandra, Dalz. in Hook. Kew Jour. Bot. II, 258; Fl. Br. I. 1, 509; Dalz. & Gibs, Bomb. Fl. 30; Cooke Fl. Pres. Bomb. 1, 185.

A robust, spinous climbing shrub; spines ·5″-·75″ long, axillary, recurved; all parts glabrous. Leaves large, 3-foliate; petioles 2″-3″ long; leaflets 2·5″-4·5″ by 1·20″-2·5″, nearly equal, elliptic, coriaceous, obtusely acuminate, entire; venation inconspicuous beneath; petiolules ·25″ long. Flowers ·5″ across, in short panicles. Calyx cupular, slightly lobed, glandular. Petals ·25″ long, imbricate. Filaments 8, free, short, broad at the base; anthers sagittate, apiculate. Ovary 3-celled; style stout, glandular; stigma capitate. Fruit obovoid, triangular, size of an olive, gland-dotted, green, 2-3-seeded; seeds in a resinous pulp.

Beddome in a note at the bottom of page 47 of his Forester's Manual says that there are two species of *Luvunga* found in the jungles on the Western

side of the Madras Presidency viz. *L. eleutherandra*, Dalz. and *L. scandens*, Ham. The former is common in some of the Bombay ghât evergreens. I have also specimens of a shrub in leaf collected both in N. Kanara and Belgaum which will probably turn out to be *L. scandens*. Ham. The leaves are large with lanceolate unequal leaflets 8″-4″ by 1·5″-·70.″ I have not seen flowers.

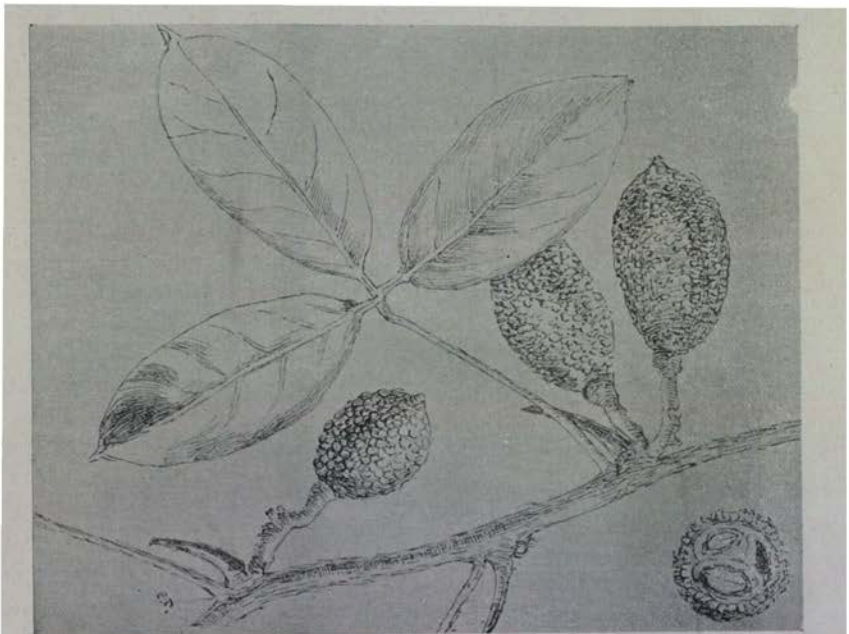


Fig 120. Luvunga eleatherandra, Dalz.

Western Peninsula from the Konkan southwards, Ceylon, 3-5000′ in evergreen rain-forests. Flowers Dec.-Jany. Fruit ripe hot season.

9. TRIPHASIA, Lour.

A spinous, glabrous, evergreen shrub. Leaves alternate, sessile, trifoliate; leaflets crenate. Flowers axillary, solitary or in 3-flowered cymes. Calyx 3-divided. Petals 3. Stamens 6, inserted around a fleshy disk; filaments subulate, dilated at the base. Ovary 3-celled, ovoid, narrowed into a slender, deciduous style; cells 1-ovuled; stigma obtuse or capitate, 3-lobed. Berry small, 1-3-seeded. Seeds immersed in mucilage; testa coriaceous; cotyledons plano-convex, often unequal or lobed.

T. trifoliata, DC. Prodr. 1, 536; Fl. Br. I. 1, 507; Dalz. & Gibs. Bomb. Fl. Suppl. 12; *T. Aurantiola*, Lour.; Cooke Fl. Pres. Bomb. 1, 184. *China limbu.*

A spinous, straggling shrub. Leaflets thick and soft ·75″-1·5″ by ·5″-·75″; the terminal leaflet largest. Flowers odorous, on 1 to several-flowered cymes. Calyx 3-lobed, Petals 3, white, linear-oblong, ·5″ long. Fruit ellipsoid, ·5″ long, fleshy, gland-dotted. Cultivated in gardens throughout the Presidency. A native of China. Fruit used in Chinese preserves.

10. LIMONIA, LINN.

Shrubs or small trees. Leaves 3-foliate or imparipinnate; petiole and rachis winged. Calyx 4-5-divided. Petals 4-5, imbricate. Stamens 8-10, inserted around an annular or stipitate disk. Ovary oblong, 4-5-celled; ovules 1-2 in each cell; style short, stout, deciduous; stigma obtuse or capitate. Berry globose. Seeds imbedded in mucilage; cotyledons fleshy; albumen O.

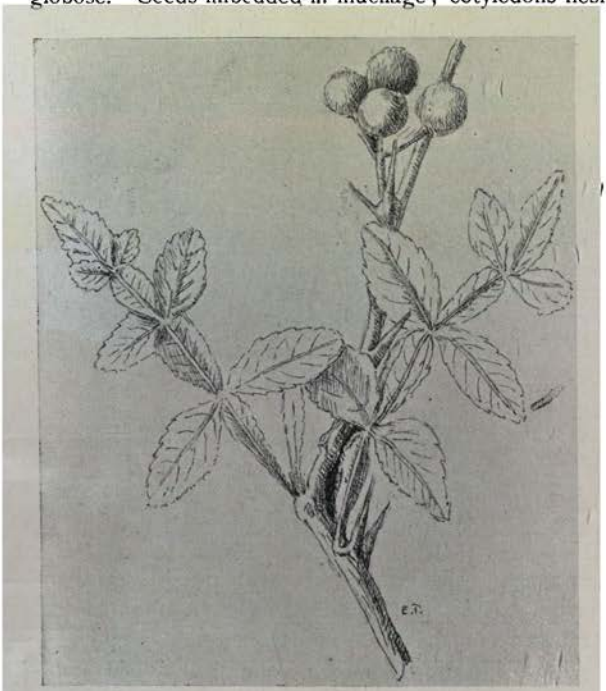


Fig 121. Limonia acidissima, Linn.

L. acidissima, Linn. Fl. Br. I. 1, 507; Dalz & Gibs. Bomb. Fl. 29; Bedd. For. Fl. 45; Brandis For. Fl. 47; Cooke Fl. Pres. Bomb. 1, 185; Gamble Ind. Timb. 127. *Naibullal*, K.; *Tondsha*, M.

A spinous, glabrous, small tree; spines straight, ·5″-1″ long. Leaves imparipinnate; leaflets 2-3 pairs, 1″-2″ by ·5″-1″, conspicuously gland-dotted, sessile, ovate, emarginate, crenulate; terminal leaflet usually largest; rachis and petiole broadly winged, jointed; joints of rachis obovate. Racemes short, axillary, pubescent, subumbellate, few-flowered. Flowers 4-merous. Calyx small, glandu-

lar, 4-lobed; lobes ovate. Petals 4, fragrant, white, ·25″ long, elliptic. Disk annular or stipitate. Ovary 4-celled with 1 pendulous ovule in each cell; style short. Fruit globose, 1-4-seeded, ·25″ in diameter, black when ripe; pedicels ·75″ long.

Dry hills in various parts of India, N.-W. Himalaya, Assam, Behar, W. Peninsula, Bombay and Madras, in the dry districts; common in the Belgaum District on the Lower Cuddapah series of rocks (at Gokak, Sutguttee etc.); also in the dry plains at the foot of the Bababuden hills of Mysore. Fl. April-May. Fruit Aug.-Sept. Stems 20′ high and 6″ in diameter. Bark corky, cinerous, rugose. Wood light-yellow, hard, close-grained, with prominent concentric, white lines crossing the numerous, fine medullary rays; suitable for the lathe and a likely substitute for boxwood; furnishes excellent fuel. Fruit black, very bitter, exported to Arabia, where it is used as a condiment; said to be used in Sind as a remedy for diabetes.

11. PARAMIGNYA, Wgt.

Erect shrubs or often armed climbers. Leaves 1-foliate, quite entire, coriaceous. Flowers rather large, axillary, solitary or fascicled. Calyx cupular, lobed. Petals 4-5, usually free, imbricate. Stamens 8-10; filaments equal or nearly so, inserted around a columnar disk; anthers linear, long. Ovary 3-5-celled; cells 1-2-ovuled; style elongate, deciduous. Berry ovoid, contracted at the base, 1-5-seeded; seeds large, compressed; testa membranous; cotyledons fleshy, equal.

P. monophylla, Wgt. Ill. 1, 109; Fl. Br. I. 1, 510; Dalz. & Gibs. Bomb. Fl. 30; Grah. Cat. 25; Gamble Ind. Timb. 128; Cooke Fl. Pres. Bomb. 1, 186. *Kurwa-wagutti,* M.; *Ranyeed,* Vern. *Kan-nimbe, Kankanchi-bally,* K.

A stout, climbing, evergreen shrub; branches green; spines recurved. Leaves ovate, 2″-4″ by 1″-2″, abruptly acuminate, glabrous and conspicuously gland-dotted; nerves numerous, distinct; petioles stout, ·5″ long. Flowers 1″ in diameter, white, fragrant. Calyx cupular, broadly-lobed. Petals linear, imbricate. Filaments flattened, free. Ovary hairy, 3-5-celled; ovules 1-2, in each cell, obliquely superposed; style long, stout, hairy at the base; stigma capitate. Fruit yellow, tomentose, pear-shaped, 5-angled, 4-seeded, 1″-1·25″ long; rind thick and filled with resinous glands; peduncles ·75″ long.

Sikkim Himalaya, ascending to 5000′, Malay Peninsula, W. Peninsula, from the Konkan to Ceylon; very common throughout the rain-forests of the Konkan and North Kanara. Fl. H. S. Fr. R. & C. S. Stems 3″ in diameter. Bark grey, corky and scaly; inner-bark white, fibrous. Wood yellow, moderately

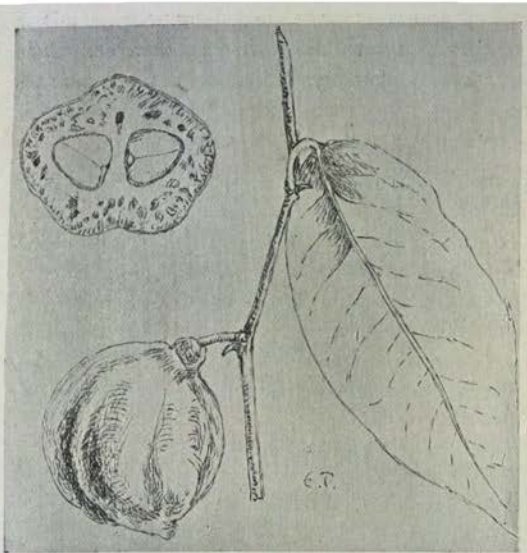


Fig 122. Paramignya monophylla, Wgt.

hard, sometimes with dark irregular patches. Pores small or large, numerous, subdivided or in short lines on a radial section. Medullary rays fine, numerous, wavy round the pores. There are narrow distinct concentric lines of white tissue at irregular distances apart and which sometimes anastomose. Weighs about 42 lbs. to the cub. ft. The root and bark are used in native medicine.

12. ATALANTIA, Corr.

Spinous shrubs or small trees. Leaves simple, coriaceous. Flowers in racemes or fascicles, axillary, rarely terminal. Calyx 3-5-lobed or irregularly split. Petals 3-5. Stamens 6-8, rarely 15-20; anthers broad with a cordate base or linear-oblong; filaments free or connate. Disk annular or cupular. Ovary sessile or stipitate, 2-5-celled; ovules 1-2, collateral; style deciduous; stigma capitate. Berry globose; rind leathery; seeds oblong; cotyledons fleshy, plano-convex.

Calyx irregularly split to the base on one side. Flowers fascicled or racemose; pedicels long ...	1. A. monophylla.
Calyx regularly or sub-regularly 4-5-lobed; pedicels short. Spines short. Racemes 1″-3″ long. Fruit ·5″ in diameter.	2. A. racemosa.
Spines long. Racemes very short. Fruit ·75″ in diameter	3. A. ceylanica.

1. A. monophylla, Correa, DC. Prodr. 1, 535; Fl. Br. I. 1, 511; Bedd. Fl. Sylv. 46; Cooke Fl. Pres. Bomb. 1, 187; Gamble Ind. Timb. 129; *Atalantia floribunda,* Wgt. Ic. t. 1611.

A large shrub or small tree; spines ·3″-·5″ long, straight, axillary. Leaves ovate, coriaceous, usually 2-lobed at the apex, entire, 1″-3″ by ·5″-1·5″; petioles

·25″ long. Flowers ·3″-·5″ long, fascicled or racemose, pedicelled; pedicels ·5″-·75″ long, pubescent, soon glabrous, minutely bracteolate at the base. Calyx irregularly split to the base; margins erose, scarious. Petals obtuse. Filaments 8, connate into a cleft tube; anthers broad. Ovary sessile on a small disk, 4-celled; ovules 1-2 in each cell; style deciduous. Berry globose, like a lime, 4-celled. This species and *A. racemosa,* W. & A. are closely allied. It is quite possible that the latter only is indigenous in the Bombay Presidency. Graham in his Catalogue of Bombay plants states that *A. monophylla,* is abundant on the ghâts, and cites Sidney Point, Mahableshwar, as a locality; he was probably referring to the common *A. racemosa,* which is found there. In Dalz. & Gibs. Bomb. Fl. 28. *A. monophylla,* is described as a large climbing shrub and it is difficult to surmise exactly what species is referred to. I have never seen any specimens of *A. monophylla,* Corr. collected in the Bombay Presidency and doubt whether there are any such in existing herbaria.

Silhet at the foot of the Khasia Mountains, Southern India and Ceylon. Fl. Oct.-Feb. Fr. April-June. A large shrub or small tree. Wood yellow, hard, close-grained, with numerous white concentric lines; weighs 66 lbs. to the cub. ft.; recommended as a substitute for boxwood. Closely allied to *A. racemosa,* W. & A. with which it should, I think, be united.

2. A. racemosa, W. & A. Prodr. 91; Fl. Br. I. 1, 512; Bedd. Fl. Sylv. 46; Cooke Fl. Pres. Bomb. 1, 187; Gamble Ind. Timb. 129; *Sclerostylis atalantioides,* Wgt.; Dalz. & Gibs. Bomb. Fl. 29. *Kan-limbu* or *Ran-limb,* Vern. *Adwinimbe,* K. *The wild Lime.*

A large, much-branched shrub or small tree, spinous or unarmed. Leaves ovate, oblong or oblong-elliptic, entire or crenulate with an obtuse or emarginate tip, coriaceous, 3·5″-1·25″ by 1·5″-·60″; petioles ·3″ long Flowers white, ·5″ across, sweet-scented, 4-merous, in 1″-3″ racemes; pedicels short, ·2″ long, usually glabrous; buds globose, Calyx more or less equally 4-lobed; lobes acute or obtuse. Petals white, elliptic or obovate, ·4″ long. Filaments united in a long tube; anthers cordate. Disk cup-shaped. Ovary sessile, 2-3-celled; ovules 2 in each cell, collateral; style short, clavate. Fruit globose, ·75″ in diameter, rough with pitted disks; pedicels ·3″ long.

Western Peninsula from the Konkan to Ceylon; common in some of the N. Kanara rain-forests; gregarious in the forests near the Ainshi Ghat. Flowers in the cold-season from Nov. Fruit ripe in April.

3. A. ceylanica, Oliv. in Jour, Linn. Soc. 5, Suppl. II, 25; Fl. Br. I. 1, 512; Bedd. Fl. Sylv. 46; Cooke Fl. Pres. Bomb. 1, 188.

A large, spinescent shrub; spines 1″-1·25″ long. Leaves ovate, oblong, almost lanceolate, entire, tip emarginate, very pale-green beneath when dry,

6·5″-2″ by 2·5-·70″; petioles ·25″-·4″ long. Flowers bracteolate, in short, axillary, glabrous racemes; buds ovoid. Calyx 4-lobed; lobes obtuse, scarious and ciliolate on the margins. Petals 3-5, ovate-obtuse, ·6″ long. Stamens 8; filaments flat, free, alternate longer; anthers large, shining, cordate. Ovary sessile, seated on the cupular disk, 2-celled; ovules 2 in each cell. Fruit globose, 1″ in diameter, 1-2-seeded. The larger acuminate leaves, inflorescence, fruit, the free filaments, the longer and more slender spines and the shrubby habit of the Bombay plant separate it from *A. racemosa,* W. & A.

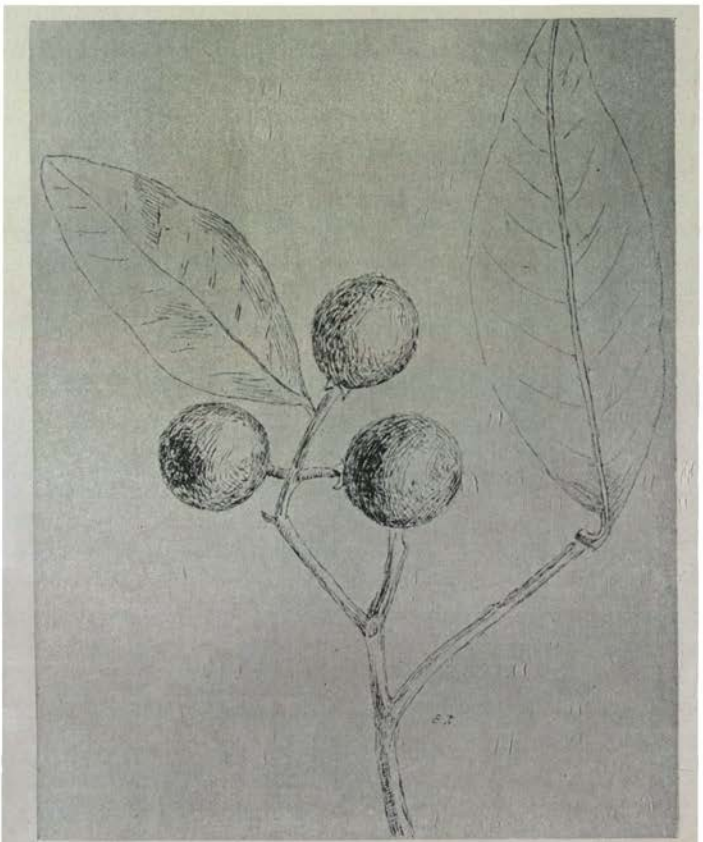


Fig 123. Atalantia racemosa, W. & A.

Western Peninsula, from the Konkan southwards, Nilghiris, Ceylon and Malacca. A large spinescent shrub, common in the N. Kanara and Belgaum evergreen ghát forests. Fl. C. and H. seasons. Fr. H. and R. seasons.

13. CITRUS, LINN.

Evergreen spinous shrubs or trees. Leaves simple, 1-foliate, coriaceous; petioles often winged. Flowers white or tinged with red, sweet-scented, fascicled or in small cymes. Calyx cup-shaped, 4-5 cleft. Petals 4-5, thick, with glandular dots, imbricate in bud. Stamens 20-60; filaments more or less connate. Ovary many-celled on a large, annular or cup-shaped disk; style terete, deciduous with a capitate, lobed stigma; ovules axile, biseriate, 4-8 in each cell. Berry globose, fleshy, many-celled, with membranous septa filled with fusiform, distended vesicles. Seeds few in each cell; testa leathery; albumen O; embryo straight; radicle short; cotyledons thick, fleshy, oily, often unequal; 2-3 embryos often in one seed.

All parts glabrous. Fruit-vesicles concrete.
Petals coloured. Flowers often unisexual ... 1. C. medica.
Petals white. Flowers bisexual ... ... 2. C. Aurantium.
Young shoots and nerves of leaves beneath pubescent. Fruit-vesicles distinct ... ... 3. C. decumana.

1. C. medica, Linn; Fl. Br. I. 1, 514; Brandis For. Fl. 52; Dalz. & Gibs. Bomb. Fl. Suppl. 13 *Citron, Lemon, Sour Lime, Sweet Lime. Nimbu, mitha nimbu, bijapara, mahalunga, bijori,* Vern.

Universally cultivated in tropical and sub-tropical regions. For a full account of the origin of the cultivated oranges and lemons see DeCandolle's Origin of Cultivated Plants, pp. 176-188

2. C. Aurantium, Linn.; Fl. Br. I. 1, 515; Brandis For. Fl. 53; Dalz. & Gibs. Bomb Fl. Suppl. 12. *Sweet Orange, Narangi,* H. cultivated in the Deccan.

3. C. decumana, L.; Fl Br. I. 1, 516; Brandis For. Fl. 55; Dalz. & Gibs. Bomb. Fl. Suppl. 12. *Shaddock, Pumelo.* Indigenous in Java. Cultivated throughout the Presidency. The fruit attains great perfection in gardens near the coasts of North Kanara and the Konkan.

14. FERONIA, GÆRTN.

A spinous tree. Leaves alternate, imparipinnate; leaflets 5-7; petioles winged or not. Flowers polygamous, in panicles or racemes. Calyx small, 5-toothed, deciduous. Petals usually 5, imbricate. Stamens 10-12; filaments dilated, villous at the base. Ovary 5-celled; ovules numerous in several series; style O; stigma fusiform, deciduous. Fruit globose, 1-celled, filled with pulp; rind hard; seeds numerous; cotyledons thick, fleshy.

F. Elephantum, Correa, Roxb. Fl. Ind. II, 411; Fl. Br. I. 1, 516; Dalz. & Gibs. Bomb. Fl. 30; Brandis For. Fl. 56; Bedd. Fl. Sylv. t. 121; Cooke Fl. Pres. Bomb. 1, 191; Gamble Ind. Timb. 131. *Cawtha,* Vern.; *Katori, kawatha,* Sind; *Kavat, kovit,* M.; *Balal, byala, belada, bel,* K. *Elephant* or *Wood Apple.*

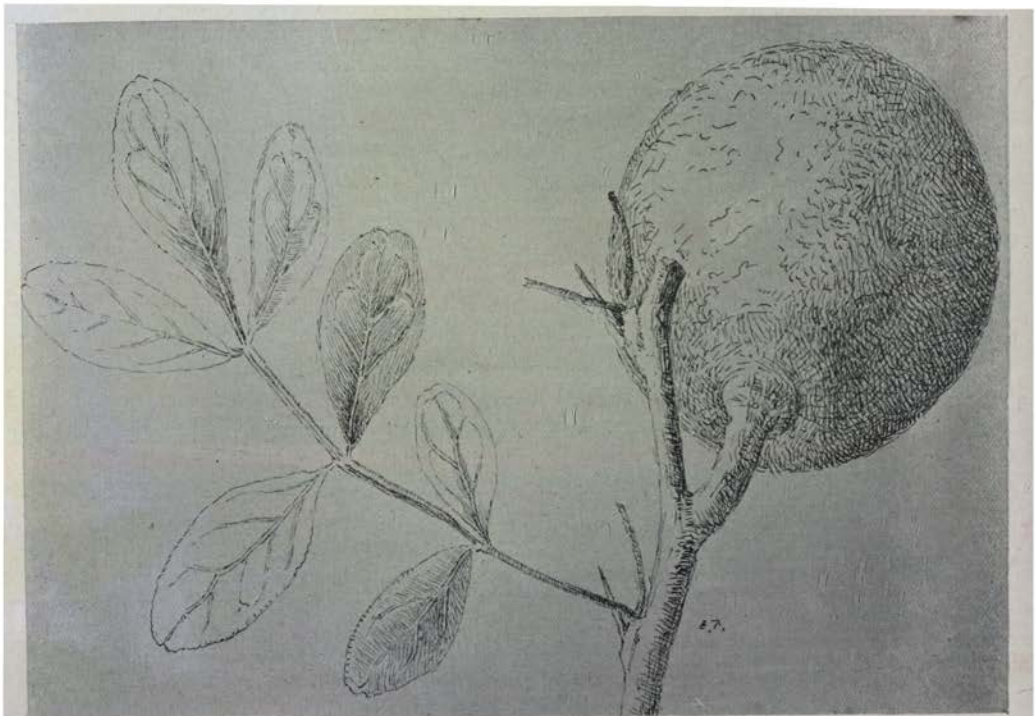


Fig 124. Feronia Elephantum, Correa.

A moderate-sized tree with strong, straight, axillary spines. Leaves smelling of aniseed; petiole and rachis flat, often winged; leaflets 5-7, opposite, 2″-1″ by 1″-·5″, cuneate or obovate; tip crenate. Flowers ·5″ across, dull-red, in loose, lateral or terminal, leaf-bearing panicles; male and female often in the same panicle Calyx small, 5-lobed; lobes triangular. Petals broadly ovate, ·20″ long, spreading or deflexed. Stamens hairy at the base; filaments short; anthers large, linear. Ovary glabrous, sessile. Fruit globose, 2·5″ in diameter; rind hard, woody, grey-coloured; seeds in an edible pulp.

Throughout India in dry open situations, often cultivated. Fl. H. S. Fr. Nov.-Jan. A deciduous tree. Bark dark-grey, very rough, thick, wrinkled, with

longitudinal shallow furrows. Wood hard, yellowish-white. Annual-rings distinct, marked by a white line. Pores small, joined by bands of white tissue. Medullary rays short, white, prominent, numerous, wavy. Weighs about 50 lbs. to the cub. ft. P. equals 623 (Cunningham); 645 (Skinner). The wood is used for house-building, agricultural implements, etc., and is also well adapted for ornamental carving. The trunk yields a white, transparent gum, like gum-arabic and the acid pulp of the fruit is made into a jelly.

15. ÆGLE, Corr.

Spinous trees. Leaves alternate, trifoliate, pellucid-punctate. Flowers large, white, bisexual, in axillary panicles. Calyx small, 4-5-dentate, deciduous. Petals 4-5, imbricate. Stamens numerous; filaments short, subulate. Disk inconspicuous. Ovary ovoid; axis broad; cells 8-20 near the circumference; ovules many, 2-seriate; stigma capitate, obtuse, deciduous. Fruit globose with a hard rind. Seeds many; testa woolly and mucous.

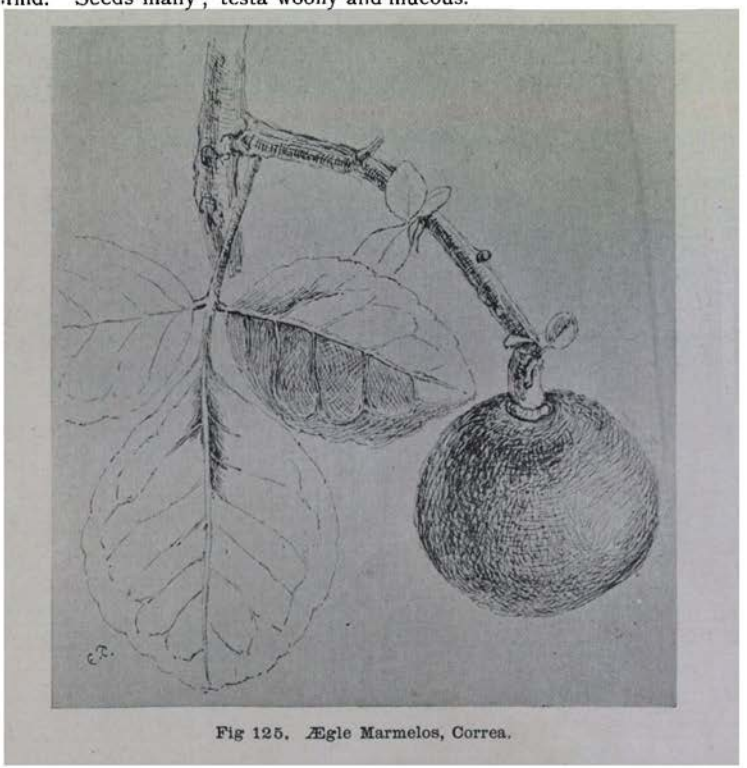


Fig 125. Ægle Marmelos, Correa.

A. Marmelos, Corr.; Roxb. Fl. Ind. II, 579; Dalz. & Gibs. Bomb. Fl. 31; Fl. Br. I. 1, 516; Brandis For. Fl. 57; Bedd. Fl. Sylv t. 161; Cooke Fl. Pres. Bomb. 1, 192; Gamble Ind. Timb. 131. *Bael Tree; Bengal Quince. Baelputri*, K.

A small deciduous, glabrous thorny tree; spines axillary, strong, straight, about 1″ long. Leaflets 3-5, ovate-lanceolate, 2″-1″ by ·75″-·5″, crenate; terminal long-petiolulate; lateral nearly sessile; petioles about 1·5″ long and the terminal leaflet's petiolule ·6″ long. Flowers 1·25″ across, scented, greenish-white, in short, lateral panicles; pedicels and calyx pubescent. Filaments somewhat fascicled, Fruit globose, oblong or pyriform, 2″-5″ in diameter; rind smooth, grey or yellow; pulp thick, orange-coloured, aromatic.

Wild in the sub-Himalayan forests, ascending to 4000′. Throughout India in dry places, wild or cultivated. One of the sacred trees of India; often cultivated near temples. Leaves shed Mch.-Apl. Fl. about May. Fruit ripe Oct.-Nov. Bark ·5″ thick; rhytidome exfoliating in irregular flakes, soft, corky, light cinerous-grey. Wood yellowish-white, hard, with a strong, aromatic scent when freshly cut, not durable. Pores small, uniformly distributed. Medullary rays wavy, fine, short, numerous, uniform and equidistant. Annual-rings distinct, often marked by a continuous belt of pores. Weighs about 50 lbs. to the cub. ft. The wood is used in house-building, for sugar mills, carts and agricultural implements. The pulp of the fruit is used medicinally and is a valuable product.

Order XXIII.—SIMARUBEÆ.

Shrubs or trees with bitter bark. Leaves alternate, simple or pinnate. Flowers small, usually in axillary racemes or panicles, regular, bracteolate, usually diclinous. Calyx 3-5-lobed. Petals 3-5, rarely O. valvate or imbricate. Disk annular, cupular or elongated into a gynophore, rarely O. Stamens as many or twice as many as the petals, inserted at the base of the disk; filaments free, often with a basal-scale. Ovary free, 1-6-celled, usually deeply lobed; styles 2-5, free or united; ovules usually solitary in each cell. Fruit drupaceous, capsular or samaroid of 2-6 distinct carpels. Seed usually solitary, albuminous or O; embryo straight or curved; radicle superior.

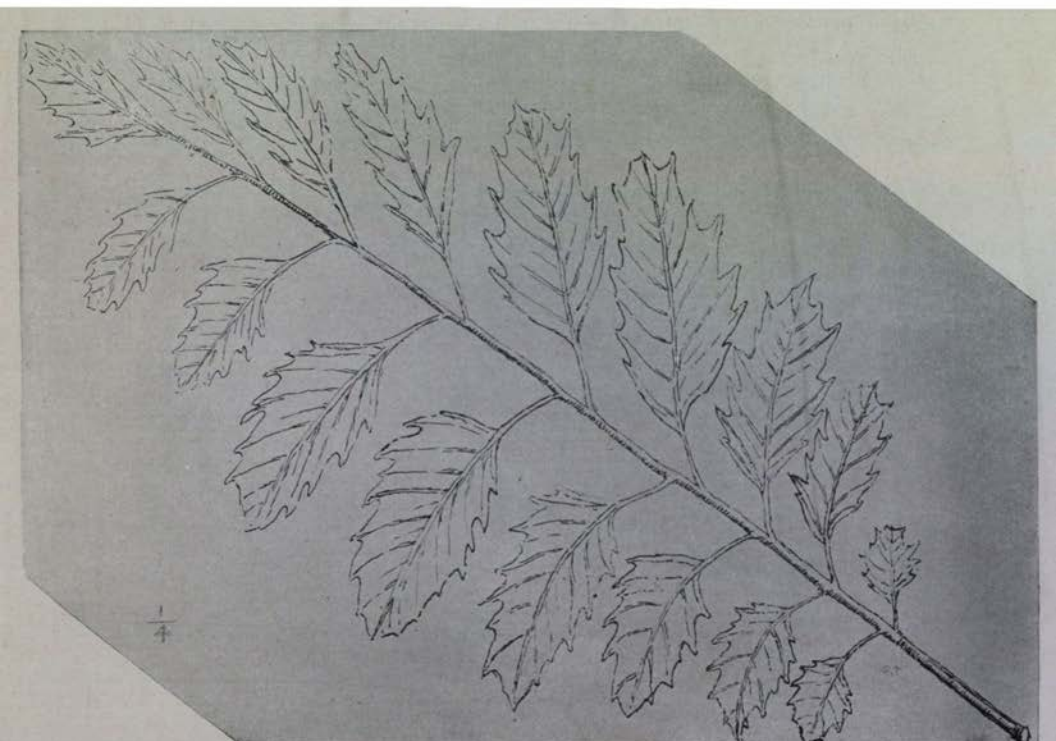


Fig 126. Ailantus excelsa, Roxb.—*leaf.*

A small order of trees and shrubs usually with bitter bark and wood.

Ovary deeply divided.			
Leaves pinnate. Fruit samaroid	1.	Ailantus.	
Leaves simple. Fruit drupaceous, winged ...	2.	Samadera.	
Ovary entire. Leaves 2-foliate	3.	Balanites.	

1. AILANTUS, DESF.

Large and lofty trees. Leaves very large, alternate, unequally pinnate. Flowers small, polygamous, in large, axillary panicles; pedicels bracteate. Calyx 5-fid; lobes equal, imbricate. Petals 5, valvate. Disk 10-lobed. Stamens inserted at base of disk; 10 in the male, 2-3 in the hermaphrodite and O in the female flowers; filaments short, without scales. Ovary 2-5-partite; styles connate; ovules 1 in each cell. Fruit of 1-5, 1-seeded samaras; wing large, membranous. Seed pendulous; albumen scanty; cotyledons orbicular, foliaceous; radicle superior.

Leaflets toothed, glandular-hairy. Samara twisted ...	1.	A. excelsa.
Leaflets entire, glabrous. Samara not twisted	2.	A. malabarica.

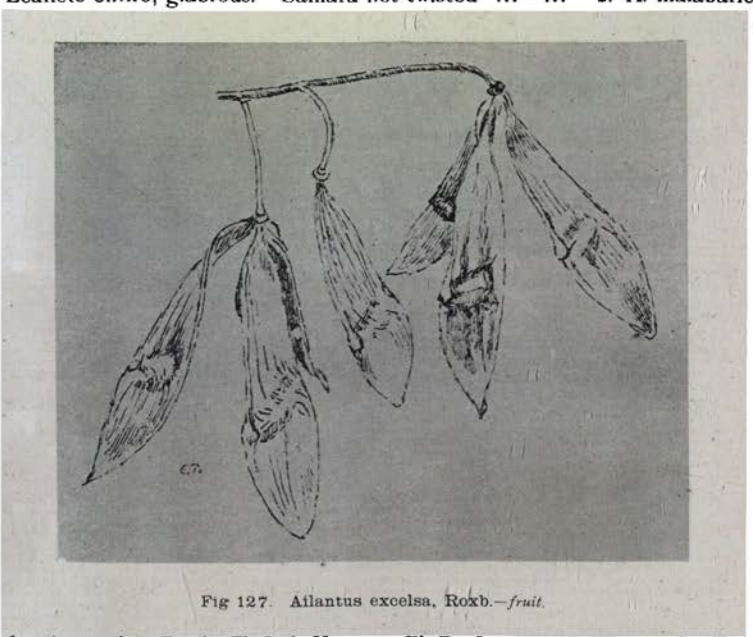


Fig 127. Ailantus excelsa, Roxb.—*fruit.*

1. A. excelsa, Roxb. Fl. Ind. II, 450; Fl. Br. I. 1, 518; Dalz. & Gibs. Bomb. Fl. 46; Brandis For. Fl. 58; Bedd. Fl. Sylv. t. 122; Gamble Ind. Timb. 123;

Cooke Fl. Pres. Bomb. 193. *Maharuk, varul,* M. *Moto-aduso,* Guz.; *Maha-nimb, limbado,* M.; *Helbeva*, K.

A lofty tree. Leaves alternate, abruptly-pinnate, from 8″ to 3′ long, more or less tomentose; leaflets 8-14 pairs, broadly falcate-lanceolate, very unequal-sided at the base, 4″-6″ long, coarsely toothed, often lobed; petiolules ·75″-2″ long. Flowers small, yellowish, in axillary, lax panicles, shorter than the leaves. Calyx-lobes ovate, triangular. Petals ·2″ long, ovate-lanceolate, glabrous, reflexed. Filaments glabrous, shorter than the anthers. Samara veined, red-coloured, twisted at the base, lanceolate, 2″ long by ·5″ broad, acute at both ends, 1-seeded; seed in centre of fruit.

Indigenous in C. & S. India, Behar and the W. Peninsula; occasionally met with in Rajputana, on the Coromandel Coast and Ceylon; common about the Broach District, Baroda, the Deccan and Guzerat. A large tree 60′-80′ high, resembles the ash in appearance; leafless during the cold season. New leaves appear during March and April. Fl. Apl. and May. Bark light-grey, granular, rough. Wood soft, white, weighs 28 lbs. to the cub. ft.; used for fishing-floats, sword-handles, native boats, &c. Bark intensely bitter, used as a febrifuge and tonic; it contains large, stony cells, also many conglomerate raphides, but no tannin.

2. A. malabarica, DC. Prodr. II, 89; Fl. Br. I. 1, 518; Dalz. & Gibs. Bomb. Fl. 46; Brandis For. Fl. 58; Bedd. Fl. Sylv. t. 122; Cooke Fl. Pres. Bomb. 1, 194; Wight's Ic. t. 1604; Trimen Fl. Ceyl. 1, 230; Gamble Ind. Timb. 133. *Gugguldhup, muddhedhup*, K.

A large tree with a tall cylindrical trunk; young parts pubescent. Leaves equally pinnate, large, 1·5′ to 2′ long, crowded at the ends of the branches; leaflets 5-10 pairs, ovate, oblong, falcate, tapering from the base, acute, 6″-3″ by 2″-1″, thin, shining, glabrous above, glabrous and glaucous beneath, very oblique at the base; petiolules ·4″ long. Flowers white, polygamous, (the bisexual somewhat larger than the males) in lax, axillary panicles; pedicels short. Calyx-lobes minute, pubescent, triangular, acute. Petals glabrous, oblong-lanceolate. Filaments in the male flowers slender, exserted. Bisexual fl.: Stamens 5-6, equalling the petals. Ovary of 2-3, flat, rounded, glabrous cells, usually united on the inner margin more than half way from the base; styles 3 from where the ovary-cells join connate into a short column, exceeding the ovary; stigma peltate, thick, rounded above, triangular, papillose. Samara 2·5″ to 3″ long, membranous, flat, oblong, obtuse at the ends, glabrous; seed in the centre, compressed, circular.

Western Peninsula from the Konkan southwards to Ceylon. Pegu; met with in the valley of the Tsit-toung, Cochinchina; often planted in Southern India.

Throughout the Konkan and North Kanara in rain-forest, from the sea-level upwards. Flowers in February and March. Fruit ripe in May.

A large deciduous tree, 100′ high by 4′ in diameter; branches covered with numerous large leaf-scars. Bark grey, rough, with a very thin, corky layer outside; inner-bark hard, mottled, yellow, fibrous, ·5″ thick. Wood soft, white, spongy; weighs 23 lbs. to the cub. ft.; worthless as timber. Yields a soft, dark brown, fragrant resin *(Mutipal),* used in native medicine, for dysentery and burnt as an incense in native temples. The bark has a pleasant bitter taste and is used as a tonic and febrifuge.

2. SAMADERA, GÆRTN.

Trees. Leaves alternate, simple. Flowers large, hermaphrodite, in axillary or terminal umbels. Calyx 3-5-partite. Petals 3-5. Disk large, conical. Stamens 8-10; with small basal-scales, included. Carpels 4-5; styles free at base, more or less united above. Fruit of 1-5, compressed, 1-seeded drupes; each with a narrow wing.

S indica, Gærtn. Fruct. II, t. 156; Fl. Br. I. 1, 519; Bedd. Fl. Sylv. 49; Grah. Cat. Bomb. Pl. 37; Cooke Fl. Pres. Bomb. 1, 194.

A small tree, with pale, yellow bark and stout branches. Leaves elliptic-lanceolate, fleshy, 8″ by 3″, 2-glandular near the petiole, nearly glabrous. Umbels dense, many flowered, long-peduncled. Petals oblong. Fruit oval, 1 ·5″ by 1″; seed brown, curved.

Indigenous on the Malabar coast; it is stated to have been found in Goanese territory. I have however never met with it either in the Konkan or in North Kanara. Wood light, yellow, soft. Weighs 26 lbs. to the cub. ft.; yields the *Niepa* bark of commerce which contains the bitter principle called *Samaderin,* used in native medicine.

3. BALANITES, DELILE.

Spinous shrubs or trees. Leaves alternate, 2-foliate; leaflets coriaceous, entire. Flowers green, in small axillary cymes. Calyx-segments imbricate. Petals 5, imbricate, spreading, glabrous or villous. Stamens 10, inserted at the base of the disk. Disk thick, conical, entire, hollowed at the apex. Ovary 1-celled; ovules solitary, pendulous. Fruit a woody, 1-seeded drupe. Seed pendulous, exalbuminous.

B. Roxburghii, Planch. in Ann. Sc. Nat. Ser. 4, 2, 258; Fl. Br. I. 1, 522; Brandis For. Fl. 59; Bedd. Fl. Sylv. 50; Grah. Cat. Bomb. Pl. 23; Cooke Fl. Pres. Bomb. 1, 105; Gamble Ind. Timb. 135. *Hingu, hinganbet,* Vern.

A small tree, armed with axillary or supra-axillary spines which are long and sharp and often leaf-bearing; young parts pubescent or tomentose. Leaves short-petioled, 2-foliate; petioles ·3″ long; leaflets nearly sessile, 1·5″-·6″ by ·75″-·4″, elliptical or obovate, puberulous, entire, coriaceous. Flowers small, white or greenish-white, fragrant, crowded in fascicled, axillary, 4-10-flowered cymes; pedicels short, ·25″ long; buds globose. Sepals and petals white-pubescent. Filaments subulate, glabrous. Disk cupular; margin 10-lobed, glandular. Ovary silky-villous; style erect, short; stigma slightly 5-lobed. Fruit large, woody, angular or 5-grooved, covered with a light grey, dry rind, enclosing a bitter pulp with an offensive smell; nut 1-seeded.

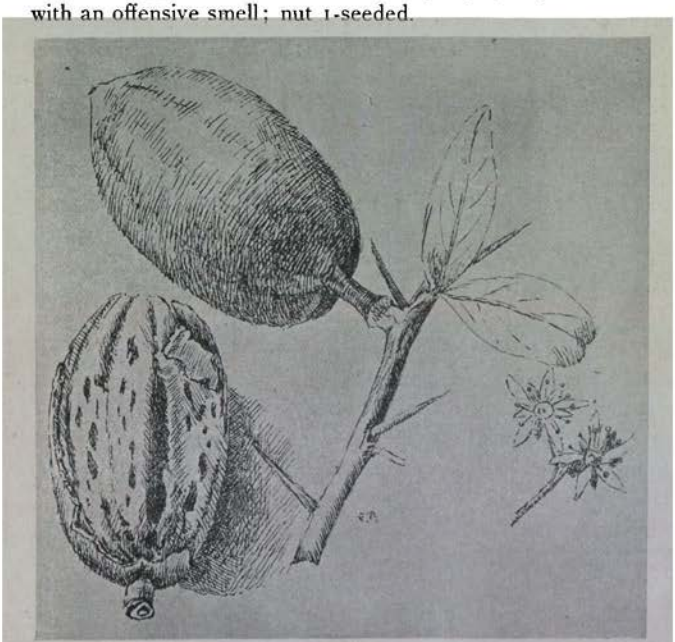


Fig 128. Balanites Roxburghii, Planch.

Common in many of the drier parts of India, Sikkim, C. Provinces, Behar, N. Circars, Guzerat, Deccan and S. India; throughout the driest parts of the Bombay Presidency in open situations; also along the banks of the Poona and Ahmednagar rivers associated with *Babul, Bor, Kera* and other thorny xerophites. Flowers and fresh foliage appear in the hot season, March-May. Fruit ripe December. Under favourable circumstances attains a height of 30′ with a trunk 2′ in girth. Foliage ashy-green. Bark yellow or cinerous. Wood yellowish-white, moderately hard; no heartwood, no annual-rings; weighs 48 lbs. to the cub. ft. Used for fuel and walking sticks. The woody fruit with the seed extracted serves as a kind of bomb in native fireworks. Seeds, bark and leaves are used in native medicine. A fixed oil is extracted from the seeds. This species differs very slightly from *B. ægyptiaca,* Del., of N. and Tropical Africa.

Order XXIV.—OCHNACEÆ.

Trees or shrubs. Leaves alternate, simple, coriaceous, stipulate. Inflorescence panicled or umbellate, bracteate; flowers hermaphrodite. Sepals 4-5, imbricate, persistent. Petals 5, rarely 4 or 10, free, deciduous. Disk enlarged after flowering. Stamens 4-10 or indefinite, inserted on the disk, dehiscing longitudinally or by apical pores. Ovary short, 1-2-celled or elongate and 1-10-celled. Fruit indehiscent, compound; each drupe or pyrene 1-4 seeded, or fruit capsular and 1-5-celled; albumen fleshy or O; embryo straight or rarely curved; radicle superior or inferior.

Shrub. Stamens indefinite. Fruit of 3-10 drupes ...	...	1. Ochna.
Tree. Stamens 10. Fruit of 5 or fewer drupes ...	...	2. Gomphia.

1. OCHNA., L.

Shrubs. Leaves serrate, glabrous, shining. Flowers large, yellow. Sepals 5, coloured, persistent. Petals 5-12, deciduous. Disk thick, lobed. Stamens numerous, shorter than the petals; anthers dehiscing longitudinally. Ovary 3-10-lobed; lobes 1-celled; ovules solitary in each cell. Fruit of 3-10 drupes seated on the broad disk. Seed erect, exalbuminous; cotyledons plano-convex, thick; radicle minute.

O. squarrosa, L.; Fl. Br. I. 1, 523; Dalz. & Gibs. Bomb. Fl. Suppl. 17; Bedd. Fl. Sylv. 50; Brandis For. Fl. 60; Cooke Fl. Pres. Bomb. 1, 196. *Mudah, narole*, K.

A shrub or small tree. Leaves elliptic, 3″-5″ by 1″-2″, acute, finely serrate, glabrous, shining; lateral-nerves numerous, parallel, fine not conspicuous; petioles short, ·1″-·2″ long; stipules setaceous, ·25″-·5″ long, deciduous. Flowers yellow, fragrant ·5″-·75″ across, in short, lateral racemes on the old wood; pedicels 1·5″ long, slender, jointed. Stamens numerous with long deciduous anthers. Style slender exceeding the stamens. Drupes ovoid, ·4″ long, smooth, black, surrounded by the persistent red sepals and seated on the broad red disk; cotyledons dark-purple.

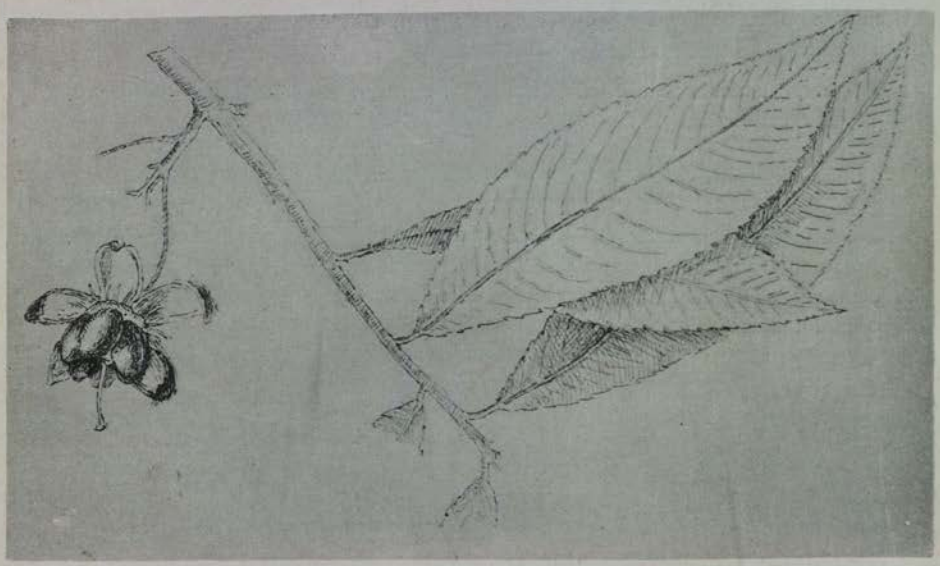


Fig 129. Ochna squarrosa, Linn.

Silhet, Burma, Pegu, Ceylon and the Madras Presidency. Common in the moist monsoon-forests of the Konkan and North Kanara on the hills near the sea, but also found inland at elevations up to 2000′; in this part of its habitat it is never, as far as I have seen, anything more than a small shrub. Fl. Feb.-Mch. Fruit ripe in May and June. Wood reddish-brown, close-grained, moderately hard; weighs 58 lbs. to the cub. ft. Probably the *Ochna* referred to by Dalzell in the Bomb. Fl. is *O. squarrosa,* L., as this fairly common species could scarcely have escaped the notice of such an observer. *O. nana,* Hamilt., reduced to *O. pumila,* Buch-Ham. in the Fl. Br. I. has not, I think, been recorded from the Bombay Presidency since Dalzell's time, and the description on page 46 of the Bo. Fl. would equally answer for either of the two species. Dalzell however mentions the arborescent cultivated form of *O. squarrosa*, on page 17 of the supplement of introduced trees added to the same Bomb. Fl.

2. GOMPHIA, Schreb.

Glabrous trees or shrubs. Flowers yellow. Sepals and petals 5 each. Disk thick-lobed. Stamens 10; filaments very short. Ovary deeply 5-6-lobed; lobes

1-celled; styles connate; stigma simple. Drupes 5 or fewer, seated on a broad, enlarged disk, 1-seeded. Seed erect, exalbuminous; cotyledons fleshy, plano-convex.

G. angustifolia, Vahl. Symb. II, 49; Fl. Br. I. 1, 525; Grah. Cat. Bomb. Pl. 38; Bedd. Fl. Sylv. 51.

A tree 30′ high. Leaves elliptic-oblong, 5″-6″ by 1·5″, shining, slightly serrate. Carpels obovate, reniform.

The W. Peninsula from the S. Konkan to Travancore; common in Ceylon. Apparently not seen by any one except Nimmo in the Bombay Konkan. A plant very doubtfully indigenous in this Presidency. Beddome says that the wood is hard and useful for building purposes.

Order. XXV.—BURSERACEÆ.

Balsamiferous trees or shrubs. Leaves alternate, generally compound, stipulate or exstipulate. Flowers usually small, regular, hermaphrodite or polygamous, in racemes or panicles. Calyx 3-6-lobed. Petals 3-6, imbricate or valvate. Disk annular, usually conspicuous, free or adnate to the base of the calyx. Stamens equal to or twice the number of petals, inserted at the base or on the margin of the disk, equal or unequal; filaments free. Ovary free, 1-5-celled; style simple; stigma undivided or 2-5-lobed; ovules 2 in each cell, axile, usually pendulous. Fruit drupaceous, rarely pseudo-capsular and dehiscent. Seeds one or few, pendulous, exalbuminous; cotyledons usually twisted or crumpled; radicle superior.

Fruit a 3-valved, pseudo-capsule; pyrenes separating from the axis.	1. Boswellia.
Fruit indehiscent, drupaceous	
Calyx 5-fid, bell-shaped	2. Garuga.
Calyx 4-toothed, urceolate	3. Balsamodendron.
Calyx 3-fid, campanulate	4. Canarium.

1. BOSWELLIA, Roxb.

Resinous trees with white bark. Leaves imparipinnate, deciduous; leaflets opposite, sessile, serrate. Flowers small, white, hermaphrodite. Calyx 5-toothed. Petals 5. Disk annular, crenate. Stamens 10, alternately longer and shorter, inserted at the base of the disk. Ovary 3-celled; ovules 2 in each cell, pendulous. Fruit 3-valved, opening septifragally; the dissepiments remaining attached to the axis and bearing 3 compressed seeds, pendulous from the top of the inner angle and enclosed in a hard bony shell with a broad membranous wing; the endocarp of the fruit separated from the pericarp. Seed exalbuminous; cotyledons trifid; lobes laciniate; radicle superior.

B. serrata, Roxb., ex Coleb. in Asiat. Res. IX, 379. t. 5; Fl. Br. I. 1, 528; Cooke Fl. Pres. Bomb. 1, 198; *B. thurifera*, Roxb. Grah. Cat. 42; Brandis For. Fl, 61; Bedd. Fl. Sylv. 52. *Salai, salphullie*, Vern.

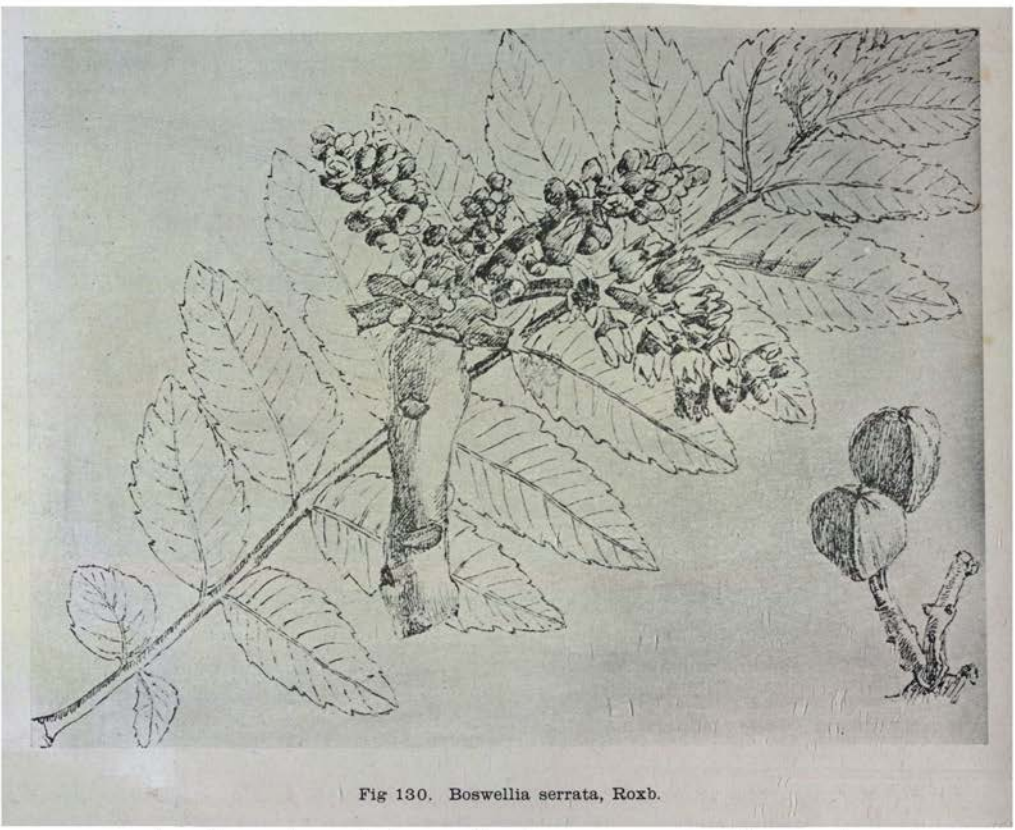


Fig 130. Boswellia serrata, Roxb.

A small or moderate-sized, gregarious tree ; young parts and leaves pubescent. Leaves crowded near the ends of the branches, about 1′ long; leaflets 8-15 pairs, opposite or nearly opposite, 1″-2·5″ by ·5″-1·25″, lanceolate or ovate, acute or obtuse, inequilateral, sessile, coarsely crenate-serrate, variable in the amount of pubescence. Flowers white, ·25″ across, in axillary racemes shorter than the leaves. Bracts small, deciduous. Calyx cup-shaped, 5-7-toothed. Petals shortly clawed. Anthers 10-12, hairy. Disk fleshy, red, surrounding the ovary. Stigma 4-5-lobed. Fruit ·25″ long, trigonous, splitting into 3 valves, subtended by the woody disk.

Forests at the foot of the Himalaya as far west as the Sutlej, Central India from Behar to Rajputana, the Deccan to within 20 miles of the W. ghâts, very abundant on the Satpudas; nearly pure but sometimes mixed with *Sterculia urens,* and other species, in the Khandesh forests, ascends to 3800′ in the

Akrani; in the Belgaum Collectorate near Padshapore. Usually a small tree about 30′ high, sometimes attains a girth of 6′, grows in open formation and suffers little or no injury from the annual forest fires. The old leaves fall about March-Apl. Fl. Feb.-June. Fresh foliage appears in June. Bark ·5″ thick, greenish ash-coloured. Wood becomes dark on exposure, soft, not durable, after Powellization however it becomes an apparently handsome and useful timber, immune from the attacks of white ants. Coarse and open-grained; weighs about 36 lbs. to the cub. ft. Used for fuel and charcoal. Along with other species of *Boswellia* yields a kind of *Frankincense* or *Olibanum* which is used medicinally and is sold in the bazars under the name of *Labanu*, or *Kundur*. The principal source of supply of true *Frankincense* is from certain species of *Boswellia* growing in Somaliland.

2. GARUGA, ROXB.

Trees. Leaves alternate, imparipinnate, crowded at the ends of the branches; leaflets opposite, subsessile, crenate. Flowers polygamous. Calyx campanulate, 5-cleft, valvate. Disk large, crenate, lining the calyx. Petals 5, inserted below the petals. Ovary ovoid, 4-5-celled; stigma capitate, 4-5-lobed, 2 collateral ovules in each cell. Drupe globose, fleshy, containing 1-5, 1-seeded pyrenes. Seeds solitary in each pyrene; cotyledons thin, twisted.

G. pinnata, Roxb. Cor. Pl. III,5, t. 208; Fl. Br. I. 1, 528; Brandis For. Fl. 62; Bedd. Fl. Sylv. t. 118; Dalz. & Gibs. Bomb. Fl. 313; Cooke Fl. Pres. Bomb. 199; *Kudak, kakad,* M.; *Halabalagi, arnelly, batagi, khandergai,* K.; *Kurak, kangkur,* Vern.

A moderate-sized tree. Leaves 6″-12″ long; petioles 2″-3″ long; leaflets 6-9 pairs, 2·5″-1″ by 1·5″-·5″, opposite or nearly so, ovate-lanceolate, acuminate, oblique, crenate; tomentose when young, at length glabrous; lateral-nerves 10-15 pairs; petiolules very short or O. Flowers ·25″ long, yellow, in large pubescent, compound, spreading panicles; pedicels slender, ·25″ long, tomentose; bracts linear, deciduous. Calyx campanulate; tube ribbed; lobes ovate, rarely as long as the tube. Filaments, ovary and style hairy; stigma shallowly 5-lobed. Fruit globose, black, ·75″ in diameter; nuts generally 2, bony, tubercled outside.

Throughout the dry forests of India from the Jumna to Burmah and southwards to the Nilghiris; extends into the moist moonsoon-forest zone along the W. ghâts; found in the Satpudas where it ascends to 3800′ in the Akrani. Flowers from Feb. till May. Fruit ripens during the rainy season. In the Deccan forests, leafless during the greater part of the dry season but in N. Kanara the fresh foliage appears early in the season (in March) just after the

flowers. Like *Salai* it is able to resist the action of forest fires. Bark about 1" thick, grey or brown outside, exfoliating in large, irregularly angled flakes; inner-bark reddish. Sapwood large, whitish; heartwood dark reddish-brown, moderately hard, seasons well but is not durable. Pores moderate-sized, single or in short rows. Medullary rays moderately broad and close together; easily attacked by insects. Weighs about 40 lbs. to the cub. ft. Used for house-building and fuel. Bark used for tanning, exudes a copious white gum of no value. Fruit sometimes eaten.

Fig 130. Garuga pinnata, Roxb.

3. BALSAMODENDRON, KUNTH.

Armed or unarmed balsamiferous trees or shrubs. Leaves compound; leaflets sessile, oblique, crenate or serrate, lateral in trifoliate leaves sometimes very small. Flowers small, polygamous. Calyx urceolate, tubular, campanulate, 3-4-toothed, persistent. Petals 3-4, valvate. Disk erect, cupular. Stamens 6-10, equal or the alternate shorter, inserted on the margin of the disk. Ovary sessile, 4-celled, surrounded by the disk. Drupe ovoid, with the fleshy epicarp splitting into

2-4-valves, exposing the pulpy, lobed mesocarp which contains 1-3, bony, 1-seeded pyrenes. Seeds exalbuminous; testa membranous; embryo straight; cotyledons thin, crumpled.

Leaves usually 1 foliate	1. B. Mukul.
Leaves usually trifoliate.	
Unarmed. Stamens equal	2. B. pubescens.
Thorny. Stamens alternately long and short .	3. B Berryi.

1. B. Mukul, Hook, ex Stocks in Hook. Kew Jour. Bot. 1, 259, t. 8; Fl. Br. I. 1, 529; Brandis For. Fl. 64; Dalz. & Gibs. Bomb. Fl. Suppl. 19; *B. Roxburghii,* Stocks in Jour. As. Soc. Bomb. 2, 391 (not of Arnott); Brandis, Ind. Trees 133; *Commiphora Mukul,* Engl; Cooke Fl. Pres. Bomb. 1, 200. *Gugal, Sind Gum Gugal.*

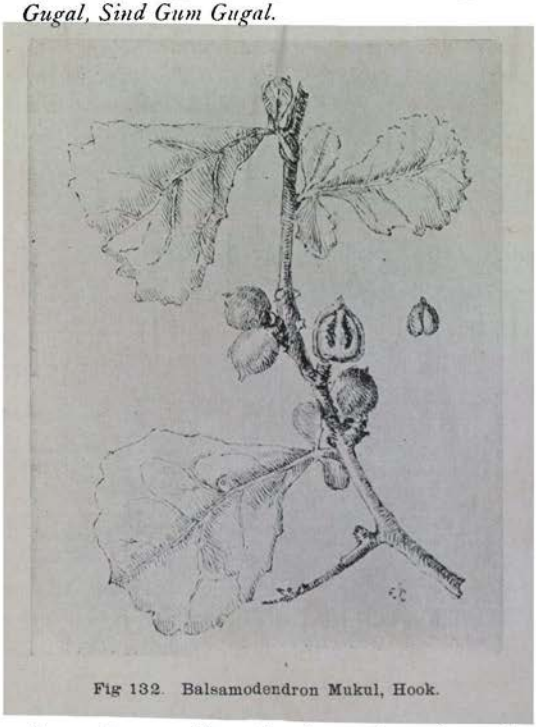


Fig 132. Balsamodendron Mukul, Hook.

A shrub with the tubercled, knotty branchlets often ending in a sharp spine. Leaves approximate at the ends of the short divaricate branchlets, nearly sessile, 1-3-foliate; leaflets obovate or rhomboid-ovate, cuneate at the base, upper-part serrate-toothed; terminal leaflet 1·5″-·75″ by ·80″-·30″. Flowers small, unisexual, 2-3-fascicled together, Male Fl.: Calyx campanulate, glandular-hairy. Petals ligulate, brownish, twice as long as the sepals, reflexed at apex. Stamens 8-10, alternately long, and short. Disk 8-10-lobed. Stigma obscurely 2-lobed; ovary abortive. Fem. fl.: Calyx and petals of the male. Stamens barren. Ovary attenuated into the short style; stigma obscurely 2-lobed. Berry ovoid, shortly pointed, ·3″ long, pale-red when ripe; the fleshy epicarp separating into 2-valves, exposing the yellow, 4-divided mesocarp, the lobes of which meet at the apex; nuts ovoid, acute, readily separating into 2, each 1-celled.

Sind, Rajputana, Khandesh, Behar, Beluchistan and Arabia. Sir D. Brandis in his Indian Trees follows A. W. Bennett in the Fl. Br. I. and keeps *B. Roxburghii,* Stocks, separate from B. *Mukul,* Hook, with which it is united by Dr. Cooke in the Fl. Bomb. Pres. Usually a stunted bush 4′-6′ high with thick, spreading branches. Bark ash-coloured, exfoliating in rough flakes; under-bark bright, shining, peeling off in thin, papery rolls. Wood even-grained, soft, light. Yields the gum resin known as *Gugal* or *Indian Bdellium,* which when heated has a disagreeable odour and is used in native medicine.

2. B. pubescens, Stocks in Bomb. Trans. 1847; Fl. Br. I. 1, 529; Brandis For. Fl. 64; *Commiphora Stocksiana,* Cooke Fl. Pres. Bomb. 1, 200. *Bayisagugal,* M.

An unarmed, small tree or shrub, rusty-pubescent when young. Leaves trifoliate, crowded on arrested branchlets; on vigorous shoots, distant and often imparipinnate; leaflets ovate or obovate, entire; terminal-leaflet stalked. Flowers 1-3-fascicled, subsessile. Calyx urceolate, shortly toothed. Petals red or white, obovate, acute, spreading, not reflexed. Stamens 8, equal in length. Disk equally toothed. Drupe red, sub-globose, 2-valved; each valve cleft half way up from the base; mesocarp orange, 4-toothed not reaching to apex of nut.

Beluchistan, on the dry hills of Sind as far south as Karachi. Yields during the cold season a small quantity of a tasteless inodorous gum, soluble in water. Fl. Mar.-Apr. The fragrant leaves and young shoots appear during May.

3. B. Berryi, Arn. in Ann. Nat. Hist. III, 86; Fl. Br. I. 1, 529; Brandis For. Fl. 65; Bedd. Fl. Sylv. t. 126; *Commiphora Berryi,* Engl.; Cooke Fl. Pres. Bomb 1, 201; *B. gileadense,* Don. Grah. Cat. Bomb. Pl. 43.

A small fragrant, thorny tree with trifoliate leaves, on slender petioles; leaflets crenate-serrate, obtuse. Indigenous on the east side of the Nilghiris; dry parts of Ceylon, rare; cultivated in the Bombay Presidency and as a hedge plant throughout Southern India. The whole tree has a grateful fragrance.

4. CANARIUM, Linn.

Large resinous trees. Leaves alternate, imparipinnate, stipulate or exstipulate. Flowers small or medium-sized, hermaphrodite or polygamous in terminal or axillary panicles. Calyx urceolate or cup-shaped, 3, rarely 2-5-cleft, persistent, valvate. Petals 3-5, imbricate below or valvate, usually exceeding the calyx. Stamens 6-10, inserted on the margin or outer side of a fleshy annular, entire or lobed disk; filaments free, or confluent below and distinct from the disk. Ovary 3, rarely 3-4-celled; cells 2-ovuled; style various; stigma subsessile. Drupe more or less 3-angled, containing a single bony, 1-seeded nut. Testa of seed membranous; cotyledons often partite, contortuplicate. "It is

probable that this genus will be eventually split up into two or three distinct genera". Fl. Br. I. 1, 531. Engler in his Monograph published in 1883 retains the genus intact for about 80 species.

C. strictum, Roxb. Fl. Ind. III, 138; Fl. Br. I. 1, 534; Dalz. & Gibs. Bomb. Fl 52; Bedd. Fl. Sylv. t. 128. *Black Dammer Tree. Raldhup*, K.; *Gugal,* Vern.

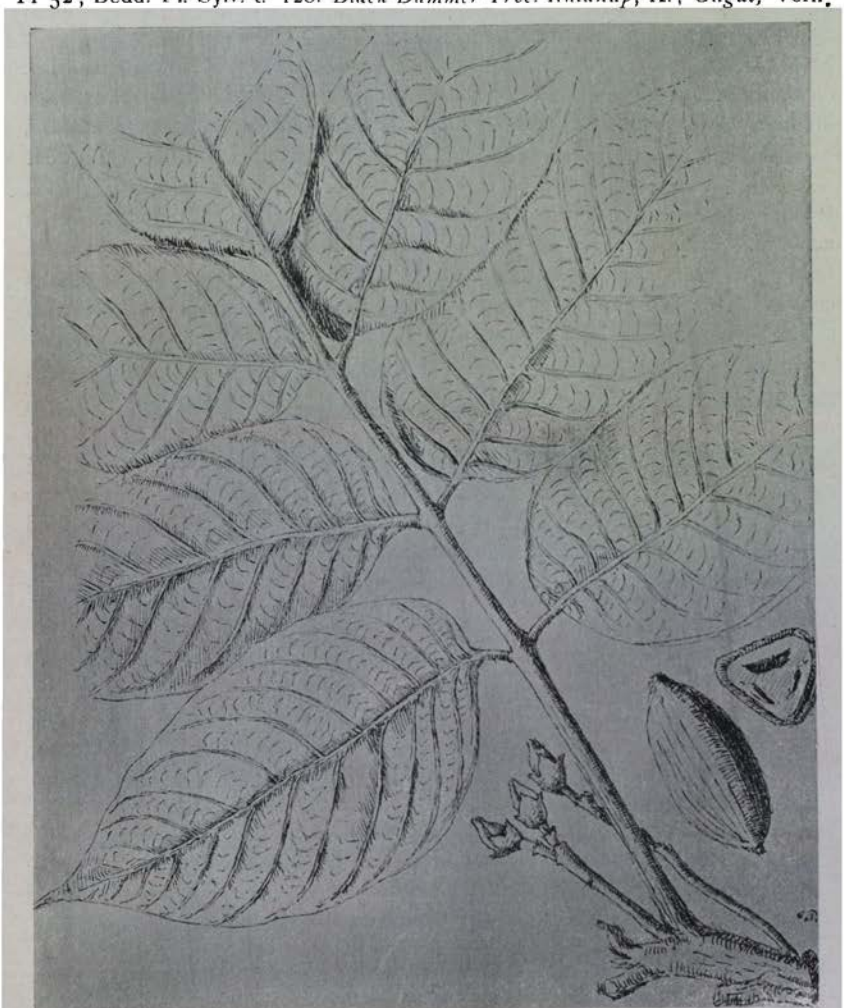


Fig 133. Canarium strictum, Roxb.

A large, tall, straight tree; young parts, inflorescence &c., densely rufous-tomentose. Leaves large, imparipinnate, 1'-1·5' long, twice as large from shoots; leaflets 7-9, ovate, 4"-6" by 3"-2," ; acuminate or lanceolate, unequal-sided at the base, denticulate-serrate, thinly coriaceous, glabrous above, pubescent-tomentose beneath; lateral-nerves prominent, about 16 pairs; petioles 4"; petiolules ·25" and the internodes between the pairs of leaflets 1·25"-1·75" long. Flowers in long, axillary panicles, shorter than the leaves; male flowers ·25" long, on the short, upper branches, in sessile or nearly sessile fascicles; female flowers ·4" long, less numerous. on very stout, short pedicels and in much shorter racemes. The pedicels are marked with the scars of the small caducous bracts. Male fl.: Calyx tomentose, campanulate, shortly and broadly 3-lobed. Petals imbricate, twice the calyx. Stamens 6; filaments united ½ way up; anthers narrowly winged, apiculate. Rudimentary ovary covered with red setose-hairs. Fem. fl. larger than the male. fl. Calyx and corolla of the male. Stamens O. Disk inconspicuous. Ovary glabrous, 3-celled; cells 2-ovuled; style as long as the ovary; stigma capitate. Drupe 1·5"-2" long, same size and with the external appearance of the hog-plum; stone very hard and woody, 3-celled, obtusely triangular.

Western Peninsula in rain-forests from the Konkan hills southwards; common on some of the N. Kanara ghâts. The leaves on the young shoots are very large and of a characteristic metallic-red colour. The young fruits are very resinous, and wounds in the bark exude large quantities of black dammer. Flowers during the hot weather. Fruit ripe next cold season in January A very large tree with smooth bark. Wood, soft, grey, light, shining on cross-section, smooth. Pores large or moderate-sized, unequally distributed. Medullary rays fine, very short, readily attacked by boring insects. Weighs 41 lbs. to the cub. ft.

Order XXVI. MELIACEÆ.

Trees or shrubs. Leaves alternate, exstipulate, usually pinnate. Flowers usually small, regular, paniculate, hermaphrodite or polygamo-dicœcious. Calyx 3-6-lobed or sepals distinct. Petals 3-6, free or connate at base. Stamens 5-20, usually twice the number of petals inserted outside base of the disk; filaments connate in a tube, rarely free. Disk hypogynous, tubular, annular or obsolete, free or connate with the ovary. Ovary 2-5-celled; cells usually 2-ovuled; style single; stigma capitate or disciform. Fruit capsular, drupaceous or berried. Seeds winged or O, exalbuminous, or sometimes with fleshy albumen, often enclosed in an arillus: cotyledons fleshy.

Seeds not winged

Leaflets often toothed. Stamens united into a tube.
Ovary-cells 1-2-ovuled; albumen thin, fleshy or O; cotyledons foliaceous. (*Melieæ.*)
Leaves simple... ... ... 1. Turræa.
Leaves bi- or tri-pinnate. Seeds albuminous.
Flowers elongated. Disk annular. Style long. 2. Melia.
Flowers globose. Disk shortly cup-shaped. Style short ... ... 3. Cipadessa.
Leaves pinnate. Disk O. Albumen O. ... ... 4. Azadirachta.

Leaflets entire. Stamens united into a tube.
Ovary-cells 1-2-ovuled, (2-5-ovuled in *Carapa*); albumen O; cotyledons thick. (*Trichilieæ.*)
Staminal-column tubular or tubular-urceolate.
Disk tubular, crenulate or entire. Style elongated 5. Dysoxylum.
Staminal-column globose or turbinate. Disk various.
Style short or O.
Disk inconspicuous or obsolete.
Anthers included in the staminal-column or nearly so.
Anthers 5 ... ... 6. Aglaia.
Anthers 6-10.
Berry indehiscent ... ... 7. Lansium.
Capsule loculicidal ... ... 8. Amoora.

Disk fleshy, annular or cup-shaped.
Anthers exserted or included.
Anthers exserted.
Berry indehiscent ... ... 9. Walsura.
Capsule loculicidal ... ... 10. Heynea.
Anthers included ... ... 11 Carapa.

Seeds winged.

Stamens united into a tube. Ovary cells with numerous ovules *(Swieteniæ.)*
Staminal-tube cup-shaped. Disk flat. Ovary 5-celled 12. Soymida.
Staminal-tube cylindrical. Disk O. Ovary 3-4-celled 13. Chickrassia.

Stamens distinct. Ovary-cells with 8-12 ovules. *(Cedreleæ.)*
Stamens 4-6, alternating with staminodes.
Disk thick, 4-6-lobed.
Capsule 5-celled, 5-valved; seeds with fleshy albumen; cotyledons sub-foliaceous... ... 14. Cedrela.
Stamens 10. No staminodes.
Disk thick, 10-lobed.
Capsule 3-lobed, 3-valved; albumen O; cotyledons plano-convex ... ... 15. Chloroxylon.

1. TURRÆA, LINN.

Trees or shrubs. Leaves entire or obtusely-lobed. Flowers elongated, white or yellow, axillary; peduncles bracteate, at the base. Calyx campanulate, 4-5-fid. Petals 4-5, spathulate, elongated, spreading in flower. Staminal-tube long; anthers 8-10, within mouth of tube, alternating with the teeth. Disk annular or obsolete. Ovary 5 or more celled; ovules 2 in each cell. Capsule 4 (or more) celled; loculicidal; valves woody, separating from the winged axis. Seeds with a broad ventral hilum; albumen fleshy; cotyledons foliaceous.

T. villosa, Benn. Pl. Jav. Rar. 182; Fl. Br. I. 1, 542; *T. virens*, Linn., Fl. Br. I. 1, 541; Dalz. & Gibs. Bomb. Fl. 36; Grah. Cat. Bo. Pl. 31; *Euonymus sp.* Bedd, Fl. Syl. 64; Wight Ic. t. 1593; Brandis Ind. Trees, 137. *Hadsandi*, M.

A large or small shrub. Leaves thin, pubescent, ovate, acute or shortly acuminate, acute or obtuse at the base, entire, 4″-2″ by 2·5″-1·25″; petioles ·25″ long, pubescent. Flowers axillary, 1″-1·5″ long, white, sweet-scented, in few-flowered clusters or short racemes; peduncles short; pedicels ·75″ long, hairy-tomentose. Calyx short, cup-shaped, pubescent outside; teeth acute. Petals yellow, linear, longer than the staminal-tube, free, glabrous. Staminal-tube

glabrous, slender, ·75″-1″ long, dilated at the top; teeth subulate, short; anthers ½ as long. Ovary 5-celled; style long-exserted; stigma capitate, urn-shaped. Capsule subglobose, glabrate ·5″ in diameter.

Western Peninsula on the ghâts from the Konkan southwards, Java. On the Mahableshwar hills; common in the moist monsoon-forests of the Supa subdivision of North Kanara in open situations. Flowers and young leaves appear during April and May.

Fig 134. Turræa villosa Benn.

Both Dalzell (Bomb. Fl. 36) and Graham (Cat. Bomb. Pl. l. c.) only mention *T. virens*, L. It is extremely probable as Dr. T. Cooke remarks in his Fl. Pres. Bomb. 1, 204, that these botanists mistook the common *T. villosa*, Benn. for *T. virens* L. This latter species is founded on 2 specimens collected at the beginning of last century by Koenig. I think *T. virens*, should therefore be excluded from Bombay floras until there is some evidence that it has been found within the limits of the Presidency.

2. MELIA, Linn.

Trees. Leaves alternate, bi-tri-pinnate; leaflets toothed or entire. Flowers often showy, in axillary panicles. Calyx 5-6-divided; segments short, imbricate. Petals 5-6, free, linear-spathulate, twisted in bud. Staminal-tube cylindrical with 10-30 teeth; anthers 10-12, inserted near apex. Disk annular. Ovary 3-6-celled; style slender; stigma capitate, deciduous; ovules 2, superposed. Fruit a drupe containing a 1-5-celled stone. Seed 1 in each cell, pendulous, albuminous.

Leaflets serrate. Flowers lilac, not mealy-pubescent. 1. M. Azedarach.
Leaflets crenate. Flowers white, mealy-pubescent. 2. M. dubia.

1. M. Azedarach, Linn.; Fl. Br. I. 1, 544; Brandis For. Fl. 68; Bedd. Fl. Sylv. t. 14; *M. sempervirens,* Sw. Prodr. 67; Dalz. & Gibs. Bomb. Fl. Suppl. 15. *Bastard Cedar, Bead Tree, Persian Lilac. Pejri, padrai,* M.; *Mullanim,* H.; *Bakayun, bukunta, drek,* Sind.; *Vilayati nim,* Vern.; *Bakam limbodo,* Guz.

A moderate-sized tree with a short, erect trunk, 40′ high and 6′-7′ in girth; young parts puberulous. Leaves bipinnate, sometimes tripinnate, 9″-18″ long; pinnæ opposite or nearly so, with 3-5-7 leaflets; leaflets opposite, subopposite or alternate, ovate or lanceolate, serrate or entire, acuminate, shortly petiolulate, ·5″-1·5″ long, not nearly so unequal-sided at the base as in *Azadirachta,* sometimes lobed. Flowers ·25″-·3″ long, usually 5-merous, lilac, honey-scented, on slender pedicels, in axillary panicles, shorter than the leaves. Calyx deeply lobed; lobes oblong. Petals linear, spathulate, patent or reflexed. Staminal-tube purple, ·25″ long with 20-30 teeth which are as long as the anthers. Ovary 5-celled; stigma capitate, 5-sulcate. Drupe subglobose, ·5″-·75″ in diameter; rind tough; stone hard, 5 or fewer-celled and seeded.

Commonly cultivated throughout India; wild in the sub-Himalayan tract; said to be wild also in Beluchistan. Bare of leaves for 3-4 months in the cold season; in full leaf and bloom from March till May. The yellow fruit ripens in the rainy season and remains on the tree whilst it is leafless. Coppices vigorously. Bark ·25″ thick, grey, smooth. Sapwood yellowish-white; heartwood soft, red. Weighs about 35 lbs. to the cub. ft. Used for furniture, but is said to warp and split to a certain extent; handsomely marked and polishes well. The bark is very bitter and is used in native medicine as an anthelmintic. The fruit yields an oil similar to that obtained from the *nim.* Strings of the stones are suspended over doors and verandahs during epidemics to avert the prevailing disease; this is the practice in Bombay. The strings of the stones are used all over India for rosaries and necklaces and as charms against disease.

M. dubia, Cav. Diss. (VII), 364 (1789); Fl. Br. I. 1, 545.; *M. composita,* Dalz. & Gibs. Bomb. Fl. 36; Brandis For. Fl. 69; Bedd. Fl. Sylv. t. 12 *Karibevan,* K.; *Nimbarra,* Vern.; *Kadu kajar,* Guz.; *Kuriaput,* M.

A large, deciduous tree; young parts, inflorescence, etc. covered with grey, mealy pubescence. Leaves bipinnate, sometimes tripinnate, 9″-24″ long; pinnæ 3-7-foliate; leaflets 2-11, opposite, ovate, or oblong-lanceolate, crenate-serrate, acuminate with a more or less oblique base; blade ·75″-3″ by ·25″-1·5″; petiolules short. Flowers greenish-white, fragrant, ·25″ across, in dense panicles, much shorter than the leaves. Calyx-lobes ovate. Petals pubescent. Staminal-tube with numerous, short, subulate teeth, shorter than the anthers. Ovary 5-celled. Fruit ovoid, size of a large olive; stone hard, thick, shining, woody fibrous, 5 or fewer-celled and seeded; seeds with a smooth black, crustaceous testa.

Sikkim-Himalaya up to 6000', Khasia Hills, Eastern and Western Peninsulas, Burmah; moist low-lying regions of Ceylon, Africa, Australia; often cultivated. In the rain and monsoon-forests of North Kanara and the Konkan; common on the Supa ghâts. Flowers during March-April. Fruit when dry resembles somewhat that of *Terminalia Chebula, (Hirda)*; it ripens during the rainy and cold seasons, October to January. A handsome, large, deciduous tree of rapid growth, 3-4 rings to the inch in North Kanara specimens, Bark dark-brown, thin, rough, scaly, exfoliating in thin, narrow strips with broad shallow, longitudinal cracks; inner-bark reddish. Sapwood grey; heartwood brownish-red, soft, lustrous. Pores large, simple or divided. Medullary rays of medium breadth, light-red, not close together. Weighs 26 to 33 lbs. to the cub. ft. Used for building purposes in Southern India. Gamble says. "Will probably be found useful for tea boxes and similar purposes and the tree should be cultivated for its rapid growth." Used for making musical instruments in North Kanara (Mundgod) and for outriggers of Native boats in Ceylon.

3. CIPADESSA, BLUME.

Shrubs or small trees. Leaves odd-pinnate. Flowers subglobose, in axillary, peduncled panicles. Calyx cup-shaped, 5-toothed. Petals 5, oblong, spreading, valvate in bud. Staminal-tube deeply 10-lobed; lobes linear, bifid at the apex; anthers between the teeth, short, subapiculate. Disk cup-shaped, adnate to the base of the staminal-tube. Ovary 5-celled; ovules 2, collateral, pendulous in each cell; style short; stigma capitate. Fruit a slightly fleshy, red-coloured drupe, 5-ribbed, 5-celled; cells 1-2-seeded. Seeds albuminous; embryo subfoliaceous.

C. fruticosa, Blume Bijd. 162; Fl. Br. I. 1, 545; *Mallea Rothii,* Adr. Juss.; Dalz. & Gibs. Bomb. Fl. 37; Bedd. Fl. Sylv. 54. *Nal bila,* H.

A much-branched, bushy shrub, erect or somewhat scandent in rain-forest. Leaves 4″-10″; leaflets 7-11, pubescent on the nerves beneath, ovate or elliptic, coarsely serrate or entire; blade 1″-3·5″ by ·5″-1·5″; petiolules short or O. Flowers white, ·1″ in diameter, in long peduncled panicles, shorter than the leaves; buds small. Calyx 5-toothed. Petals ·15″ long, oblong-acute. Staminal-tube shorter than the petals; filaments hairy inside; teeth sharp, as long as the anthers. Ovary glabrous; style short; stigma capitate. Fruit globose, red, 5-ribbed, ·2″-·25″ in diameter.

Western Peninsula from the Konkan to Ceylon in moist monsoon-forests; ascend to 4000' on the Bababuden Hills in Mysore. Dry parts of the Belgaum

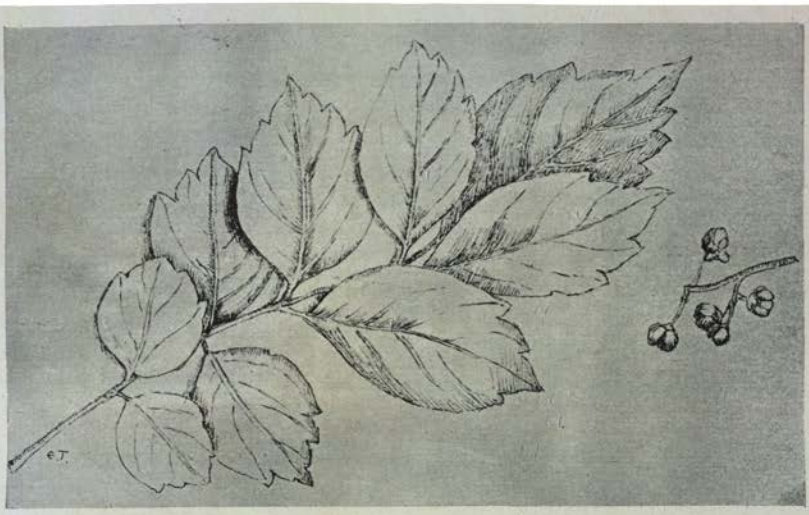


Fig 135. Cipadessa fruticosa, Blume.

District. Locally a common and gregarious shrub. "Common on the Katraj Ghât, near Poona;" Grah. Fl. & Fr. during the rainy season and at other times throughout the year. Wood only used for fuel.

4. AZADIRACHTA, A. Juss.

Trees. Leaves imparipinnate; leaflets serrate. Flowers white, in axillary panicles. Calyx 5-divided. Petals 5, free, longer than the calyx, imbricate. Staminal-tube shorter than the petals, 10-dentate at top; anthers inserted opposite the teeth. Disk O. Ovary 3-celled, each cell with 2 collateral ovules; style exceeding the ovary; stigma, short, cylindric, 3-toothed. Fruit a 1-seeded, ovoid drupe; albumen O; cotyledons fleshy, 2-lobed at base.

A. indica, Adr. Juss.; Dalz. & Gibs. Bomb. Fl. 36; *Melia Azadirachta,* Linn.; Fl. Br. I. 1, 544; Bedd. Fl. Sylv. 1, 13; *M. indica,* Brandis For. Fl. 67; Gamble Ind. Timb. 143. *Nim, nimuri, bal-nimb, baka-yan, limba, kadukhajur, limachajhada,* M.; *kai bevu,* K. *The Nim or Margosa tree.*

A large tree with a straight trunk, 40′-50′ high; girth 6′-9′. Leaves imparipinnate, 9″-15″ long, glabrous; leaflets 9-13, nearly opposite, falcate-lanceolate, very unequal-sided, sharply serrate, acuminate, shortly petioluled; blade 3″-1″ by 1·5″-·5″; petioles 1″-2″ long. Flowers small, white, pentamerous, shortly pedicelled, in large axillary panicles, shorter than the leaves; pedicels with a

few scattered hairs; bracts small, caducous. Calyx minute, glabrous; lobes rounded. Petals spathulate, obliquely imbricate in bud, ½" long. Staminal-tube as long as the petals, glabrous without, puberulous within, slightly wider at the top and 10-toothed; anthers linear, inserted opposite and below the teeth. Ovary 3-celled. Drupe oblong, ovoid, size of a small olive, yellowish-green, darker when ripe; stone with a thin, cartilaginous covering, 1-celled, 1-seeded.

Fig 136. Azadirachta indica, Adr. Juss.

A common tree throughout India, usually planted along road-sides; also self-sown throughout India and Burma. Brandis says "nowhere really wild in

N. W. India," neither have I seen it wild in the southern districts of the Bombay presidency. The *Nim* occurs however in some of the dry parts of the Deccan, Poona, Khandesh and Nasik districts with every appearance of being indigenous, it is found associated in the stunted teak jungles of Poona with *Cassia auriculata, Gymnosporia montana, Lasiosiphon eriocephalus,* and *Prosopis*, in isolated thickets on trap hills much denuded of tree vegetation by human agency. Gamble thinks that if it is wild anywhere in India it is probably so in the forests of the Carnatic, Deccan and dry inland parts of Burmah. Bark ·5" thick, dark-grey outside with longitudinal and oblique wrinkled furrows; inner-bark reddish-brown. Never leafless. The young leaves come out at the beginning of the hot season. Flowers during the cold and the hot seasons. Fruit ripe July. Produces abundant coppice shoots when cut. Growth fairly quick, 3-4 rings per inch of radius. Wood red or brown, hard, compact, scented; sapwood yellowish-white; average weight per cub. ft. about 53 lbs. Used for the construction of carts and for agricultural implements. In S. India is in good demand for furniture as it takes a fine polish and owing to its containing a bitter principle is not attacked by white ants; is used by the Hindoos for making idols. The bark exudes a clear amber-coloured gum which is collected in small tears and fragments; used as a stimulant. A fixed acrid oil of a disagreeable flavour (*Nim* or *Margosa* oil) is extracted from the seeds. This oil is extensively exported from Madras to Ceylon, where it is employed by the poorer classes for burning purposes, but it smokes offensively; also used in native medicine as an anthelmintic and antiseptic. The bark, particularly that of the root, is a valuable febrifuge. The leaves preserve paper from the attacks of insects. The above are some of the principal uses of this widely-spread and valuable tree.

5. DYSOXYLUM, Blume.

Trees. Leaves pinnate; leaflets entire, opposite, subopposite or alternate, oblique at the base, coriaceous. Flowers hermaphrodite, in axillary or supra-axillary panicles. Calyx 4-5-fid, caducous. Petals 4-5, oblong, spreading. Staminal-tube cylindrical; anthers short, 6-10, included or half-exserted. Disk tubular, equal to or twice as long as the ovary. Ovary 3-4-celled; ovules 2 in each cell; style equalling the staminal-tube. Capsule 1-4-celled, loculicidally dehiscent. Seeds arillate or O, exalbuminous.

Leaflets without glands in the nerve-axils. Calyx cup-shaped, ⅓ the length of the flower. Fruit smooth, reddish-brown... ... ... 1. D. binectariferum.

Leaflets glandular in the nerve-axils. Calyx short, Fruit verrucose, tubercled, bright yellow... ... 2. D. glandulosum.

1. D. binectariferum, Hook, f. ex Bedd. in Trans. Linn. Soc, XXV, 212; Fl. Br. I. 1, 546; Gamble Ind. Timb. 147; *D. macrocarpum*, Bedd. Fl. Sylv. 150; *Epicharis exarillata*, Arn.; Dalz. & Gibs. Bomb. Fl. 37; *Guarea binectarifera*, Roxb. Fl. Ind. 2, 240; Graham Cat. Bo. Pl. 31. *Yerindi, devdaru*, Vern.

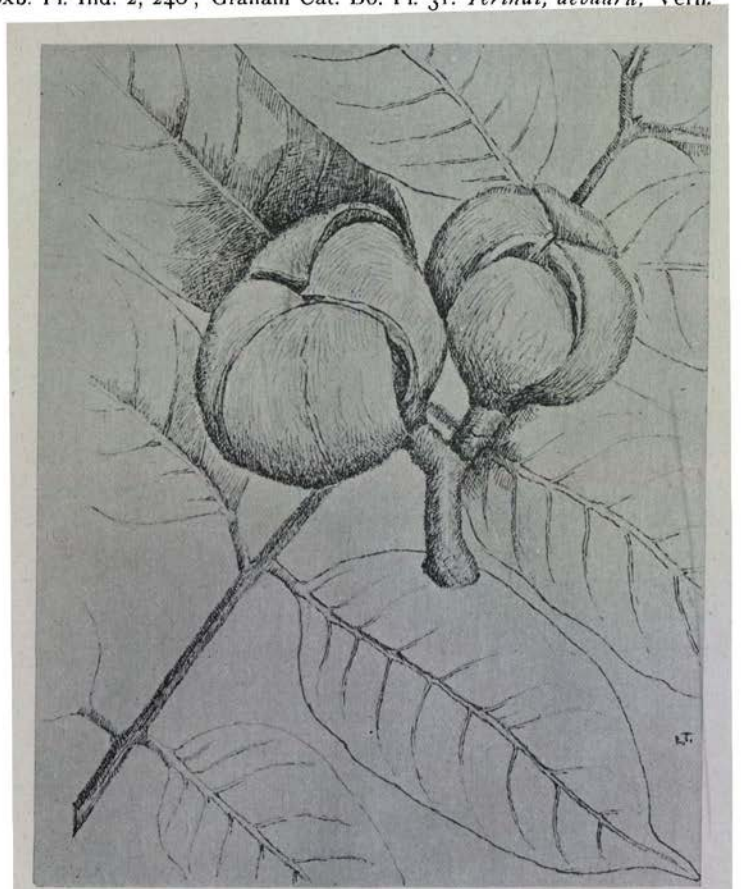


Fig 187. Dysoxylum binectariferum, Hook.

A large tree. Leaves 9″-18″; petioles stout, 3″-4″ long; leaflets 5-9, alternate, elliptic, acuminate, glabrous, thinly coriaceous, very pale above and beneath; main lateral-nerves about 10 pairs; blade 2·5″-7″ by 1″-3″; petiolules ·25″ long. Flowers ·3″ across, pale-green, 4-merous in nearly glabrous, axillary, sparingly branched panicles, much shorter than the leaves. Calyx ½ the length of the

flower, thick, urceolate, broadly irregularly toothed. Petals acute, reflexed, minutely tomentose on the outside, white hoary within, with a thickened glandular apex. Staminal-tube 4-angled; teeth 8, obtusely bifid. Disk cupular, truncate, denticulate, ciliate, equalling or slightly longer than the ovary, hairy within. Ovary ribbed, hairy, 4-celled; ovules 2 in each cell. Styles 4-angled and grooved, shortly hairy; stigma capitate, globose. Fruit subglobose, bright-yellow, 2″ in diameter, smooth, shortly and stoutly pedicelled; seeds 4, polished, dark purple; cotyledons green.

Fig 138. Dysoxylum glandulosum, Talb.

Khasia Mountains and Assam, W. Peninsula from the Konkan Ghâts southwards, from Khandala to Mysore; common in the rain-forests of N. Kanara near the Gairsoppah falls; also in the Belgaum District near Amboli. A moderate-sized tree. Fl. R.S. Fr. C.S. Wood reddish-grey, rough, close-grained, hard; weighs about 40 lbs. to the cub. ft.

2. D. glandulosum, Talb. Syst. List of Trees &c., 39 (1894); Jour. Nat. Hist. Soc. Bomb. XI, 690. t. 11; Gamble Ind. Timb. 146; *D. malabaricum,* Bedd; Fl. Br. I. 1, 548; Cooke Fl. Pres. Bomb. 1, 209; Brandis Ind. Trees, 138. *Bili-devdari, bili-budlige,* K.

A very large tree. Leaves 12″-18″; petioles angled, 4″-6″ long; leaflets, about 9, sub-opposite or alternate, ovate, elliptic, lanceolate, shortly acuminate, sometimes slightly falcate, coriaceous, puberulous when young, glabrescent in age, pale and strongly nerved beneath; lateral-nerves 10-20 pairs, with hollow, ciliate glands in the axils; blade 2″-9″ by 1·5″-3″; petiolules short, ·25″ long. Inflorescence in axillary, 4″-8″ long, puberulous panicles, often crowded near the ends of the branches; upper branches very short; lower much longer. Flowers small, ·25″ long, white, sweetly scented, shortly pedicelled; pedicels ·10″-·25″ long, slender. Calyx 4-lobed nearly to the base; lobes acute or obtuse. Petals 4, broad, reflexed in flower, slightly imbricate in the 4-angled bud, ·25″ long, pubescent on the outside. Staminal-column tubular-urceolate, somewhat 4-angled; mouth crenulate; anthers 8, included. Disk cup-shaped, truncate, equalling or ½ the ovary, crenulate and ciliate on the margin. Ovary 4-celled, white, tomentose; style equalling the staminal-column; stigma capitate, just exserted. Fruit globose or obovoid, 2″-2·5″ in diameter, bright yellow, tubercled, verrucose, and with 4 distinct, sutural lines; seeds 3-4, large, angular, with a dark-brown, smooth testa and green cotyledons.

North Kanara and probably the Konkan in rain-forests from the sea-level upwards to 2000′; common in many of the Kans near Yellapore in North Kanara. A large or very large tree with a cylindrical stem. Trunks containing 350 cub. ft. of timber were formerly not uncommon near Yellapore. Flowers during the latter end of January and in February. Fruit ripe during May and June.

Bark light-coloured, exfoliating in large scales, mostly breaking off from below, exposing underneath a peridermic layer covered with isolated groups of corky tissue; inner-bark of alternate layers of yellow (hard bast) and thin white (soft bast) tissue. Green and reddish parenchyma are present in old trees. Wood moderately hard, yellowish. Pores medium and small, equally distributed. Medullary rays fine, numerous. Distinct concentric fine wavy lines of light coloured tissue, irregularly spaced. Wood possesses a strong cedar-like smell

when freshly cut, and polishes with a fine satin lustre. Weighs 40 lbs. to the cub. ft. Logs decay rather slowly on exposure in open depôt. Wood used for building purposes in North Kanara, but is not in great demand, also for railway-carriage construction; would do for cigar boxes, tea cases, etc. but the supply is limited.

Both Brandis (Ind. Trees, 138) and Cooke (Fl. Pres. Bomb. 1, 208) refer this to *D. malabaricum,* Bedd. a Travancore species. As the Calcutta and Kew botanists were doubtful about the identity I have ventured to retain at least for the present the name "*glandulosum.*" The foot note in the Cooke's Fl. Pres. Bomb. 1, 209 does not I think satisfactorily explain the origin of the leaf-axil glands as these are present in bud and in each and every leaf of the entire foliage. They appear to be a constant specific character and not merely as suggested caused by insect agency.

6. AGLAIA, Lour.

Trees or shrubs. Leaves alternate, pinnate or trifoliate, scaly or pubescent; leaflets opposite entire, often oblique at the base. Flowers polygamo-dicœcious, minute, subglobose, in axillary panicles. Calyx 5-lobed; lobes imbricate in bud. Petals 5, concave, imbricated. Staminal-tube urceolate or subglobose, 5-toothed at the apex or entire; anthers 5, erect, included or half-exserted. Disk minute. Ovary 1-3-celled; cells 1-2-ovuled; stigma 1-3-toothed. Fruit a berry, 1-2-celled and seeded. Seeds with a fleshy, arillate covering.

A large tree. Panicles shorter than the leaves. Fruit subglobose, buff-coloured velvety-tomentose; top depressed ... ... 1. A Roxburghiana

A shrub. Panicles often longer than the leaves. Fruit ovoid, bright yellow-lepidote ... ... 2. A. littoralis.

1. A. Roxburghiana. Miq. Ann. Mus. Ludg-Bat. IV, 41; Fl. Br. I. 1, 555; Bedd. Fl. Sylv. t. 130; Gamble Ind. Timb. 149; *A. odoratissima,* Blume; Cooke Fl. Pres. Bomb. 1. 209; *Milnea Roxburghiana,* Wgt. Ic. 166.

A large, evergreen, smooth-barked tree. Leaves 4″-9″ long, usually 5-foliate, lepidote when young, glabrescent in age; leaflets opposite or alternate, usually 2 pairs with an odd one, elliptic or obovate, acuminate, acute or cuneate at the base, thinly coriaceous, entire, paler beneath; blade 3″-5″ by 1·5″-3′; petiolules ·2″-·5″ long; lateral-nerves 12-20 pairs, distinct beneath. Flowers minute, ·08″ in diameter, in supra-axillary, dense, spreading panicles, shorter than the leaves; pedicels as long as the flowers, continuous with the calyx, lepidote. Calyx 5-fid, stellate-hairy, ciliate on the margins. Petals 5, often scaly on the outside when young. Anthers 5, sessile, included in the subglobose staminal-tube. Fruit

subglobose or pyriform, often with a flattened top when young, buff-coloured, tomentose, ·75″ in diameter; seeds 2 in a mealy pulp; radicle minutely tomentose.

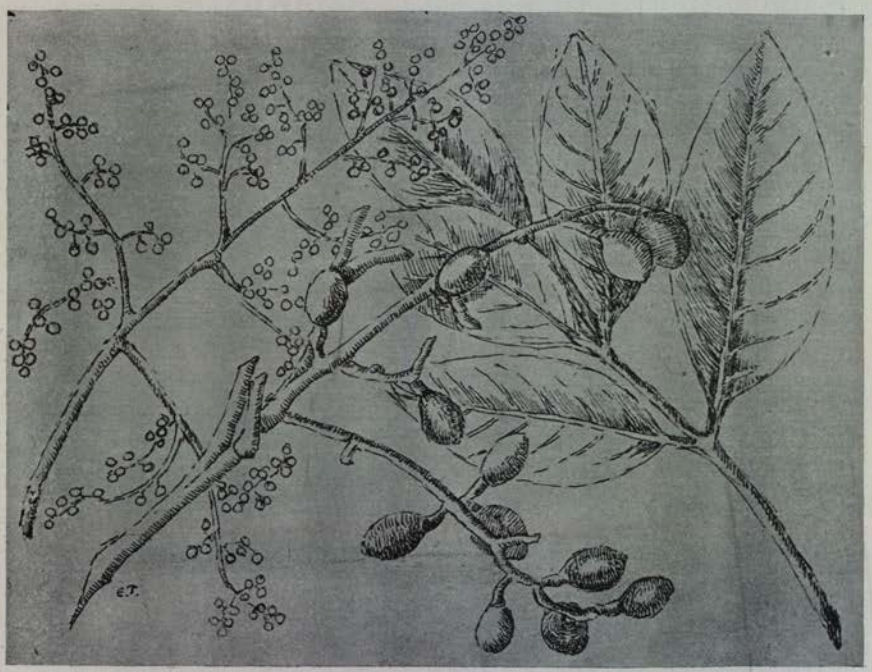


Fig 139. Aglaia littoralis, Talb.

Western Peninsula from the Konkan southwards, ascending to 6000′ in Ceylon, Singapore, Burma and the Malay Peninsula. In the rain-forests of the North Kanara ghâts from Ainshi southwards, rare. Fl. Nov.-Dec. Fr. ripe May-July. A large tree with smooth, grey bark. Wood light, brownish-yellow, very soft and lustrous. Pores medium-sized, numerous. Medullary rays broad and fine, light-coloured. Weighs about 30 lbs. to the cub. ft.

2. A. littoralis, Talb. Trees, Shrubs &c. Bomb. Pres. 76; (*A. Roxburghiana*, Miq. Var.); *A. odoratissima,* Bl.; Brandis. Ind. Trees 142.

A shrub, sometimes a small tree. Leaves 5-foliate, 3″-7″, long; leaflets ovate or obovate, obtuse, thinly coriaceous; glabrous, dark-green, shining above, paler beneath. Lateral-nerves parallel, rather distant, about 10 pairs, prominent beneath; blade 1·5″-4.5″; petiolules, ·15″ long. Flowers minute, in axillary, many-flowered, yellow panicles, often longer than the leaves, smaller and more shortly

pedicelled than those of *A. Roxburghiana*, Miq. Fruit ovoid, ·5″-·75″ long, 2-seeded; seeds ·4″-·5″ long, plano-convex, rough, surrounded by a thick, white transparent, veined, arillate pulp; epicarp thin, leathery, lepidote, of a bright-yellow colour outside, white within; cotyledons thick, fleshy transversely separated; radicle very small with a few minute shining hairs.

Very common along the coasts of the Konkan and North Kanara and probably extending further south; in open situations in low evergreen bush-wood on sandy or lateritic soils. Flowers and fruits during the rainy and cold seasons Differs from *A. Roxburghiana*, Miq. in habit, shape of leaves and the distinct fruit.

7. LANSIUM, Rumph.

Trees. Leaves oddpinnate. Flowers polygamo-dicœcious, 5-merous, in axillary panicles or racemes. Sepals and petals rounded, imbricate. Staminal tube globose, irregularly crenulate; anthers 10 in 2 rows. Disk obsolete. Ovary

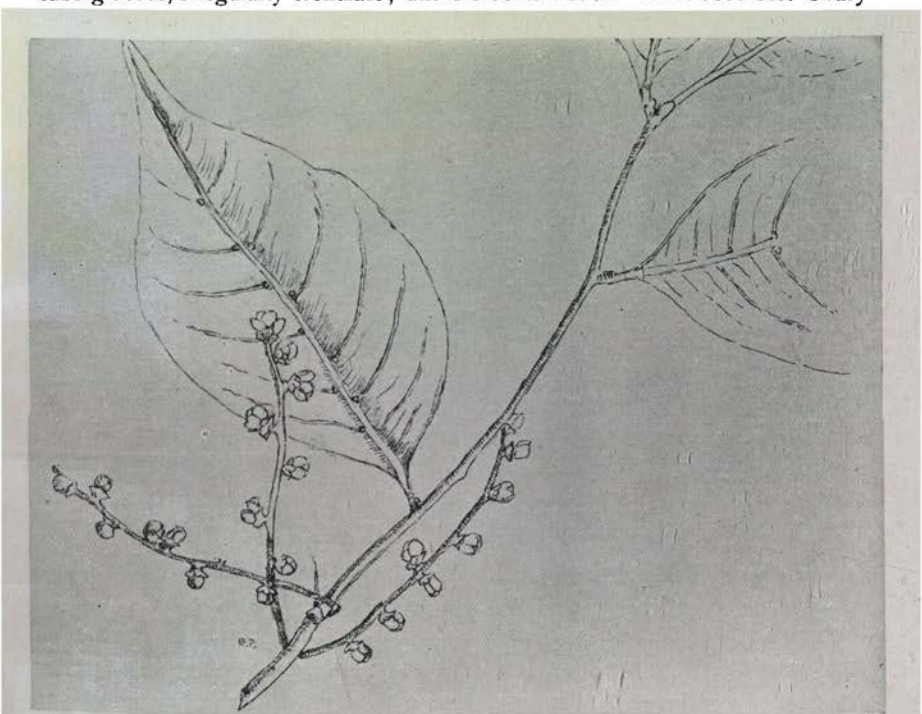


Fig 140. Lansium anamallayanum, Bedd.

globose, 3-5-celled; cells 1-2-ovuled; style short, thick; stigma 3-5-lobed. Fruit a berry, 1-5-celled, cells 1-2-seeded; seeds enclosed in a pulpy aril, exalbuminous.

L. anamallayanum, Bedd. Fl. Sylv. t. 131; Fl. Br. I. 1, 558; Cooke Fl. Pres. Bomb. 1, 210.

An evergreen tree. Leaves unequally-pinnate, 6″-9″ long, 4-6-foliate; leaflets alternate, ovate, acuminate, narrowed into a short petiole, glabrous; nerves numerous, distinct, usually with saccate ciliate glands in the axils; 3″-6″ by 1″-2″; petiolules ·1″-·5″ long. Flowers sessile, pentamerous, yellow, in axillary, fascicled spikes; buds globose, glabrous, ·15″ in diameter. Sepals rounded, imbricate, ciliate on the margins. Petals much longer than the sepals, strongly imbricate with thin margins, obtuse. Anthers 10 in 2 rows, acute, the upper 5 slightly exserted from the crenulated staminal-tube. Hermaph. fl.: Ovary strigose; stigmas globose, 3-lobed. Fruit oblong, with a dry, greyish rind, size of a grape, 2-seeded; seeds surrounded by a pulpy arillus; radicle pubescent.

Western peninsula from North Kanara southwards common; sometimes gregarious in rain-forest near the Gairsoppah, Dodmune and other southern ghâts or North Kanara, at about 2000′ elevation. A moderate-sized tree with smooth, grey bark. Fl. from March till May. Fruit ripe during the rainy season.

8. AMOORA, Roxb.

Trees. Leaves unequally-pinnate; leaflets entire, oblique. Flowers polygamo-diœcious, small, axillary, paniculate or racemose. Calyx 3-5-divided. Petals 3-5, thick, concave. Staminal-tube subglobose, 6-10-crenate; anthers 6-10, included. Ovary sessile, 3-5-celled; cells 1-2-ovuled; stigma sessile, entire or toothed. Disk obsolete. Fruit a subglobose capsule, 3-4-celled and seeded, usually loculicidally dehiscent. Seeds with a fleshy arillus; cotyledons often conferruminate; radicle superior.

Leaflets usually very oblique at the base.

Petals usually 3. Fruit dehiscent.

Leaflets 9-15, opposite. Panicles spicate ... 1. A. Rohituka.

Leaflets 4-6, alternate. Male panicles dense, pyramidal, erect ... ... 2. A. canarana.

Leaflets opposite, 3-13; terminal-one often hooded. Male panicles drooping... ... ... 3. A. cucculata.

Leaflets 3-5, usually not so oblique at the base, alternate. Petals 3-4. Fruit indehiscent ... 4. A. Lawii.

1. A. Rohituka, W. & A. Prodr. 1, 119; Fl. Br. I. 1, 559; Bedd. Fl. Sylv. t. 132; Brandis For. Fl. 69; Gamble Ind. Timb. 150; Cooke Fl. Pres. Bomb. 1, 211; *Amoora macrophylla*, Nimmo, in Grah. Cat. Bomb. Pl. 31.

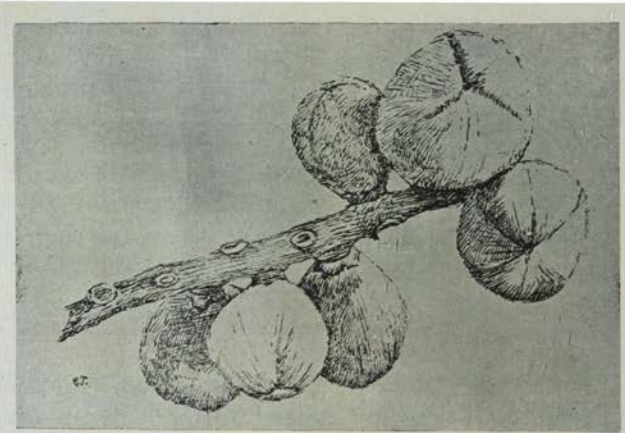


Fig 141. Amoora Rohituka, W. & A.—*fruit.*

A moderate-sized tree, with rough, grey bark; young shoots grey-tomentose; leaf-buds without scales. Leaves imparipinnate, 1·5′-2′ long; leaflets opposite, 9-13, ovate, acuminate, oblique at the base, coriaceous, dark-green shining above, paler beneath; blade 3″-7″ by 2″-3″; petiolules stout, ·25″-·5″ long. Flowers white, ·12″-·25″ in diameter. Male fl.: Flowers axillary, panicled; pedicels ·2″ long. Hermaph. fl.: Spikes stout, axillary, 8″-16″ long; pedicels very thick and short, ·04″ long. Calyx-lobes 5, slightly ciliate on the margins. Corolla-lobes 3, deeply imbricate in bud. Staminal-column urceolate, dentate; anthers 6, included. Ovary ovoid, tomentose, 3-celled; cells 2-ovuled; stigma large, 3-grooved. Fruit globose, 1·5″-2″ in diameter, yellow, 3-celled and 3-valved; seeds with a bright red, thick, fleshy arillus filled with milky juice; testa dark chestnut-coloured.

Western Peninsula from the Konkan southwards to Ceylon; evergreen rain-forests of North Kanara also in the monsoon-forests near Goond, abundant, in the Anamalais; in the moist region of Ceylon up to 3000′, Andamans and Cocos Islands, E. Bengal, Sylhet, Cachar, Assam, Malaya and the Philippine Islands. Fl. and Fr. Cold and Hot seasons. A moderate-sized, evergreen tree with thick, rough, grey bark. Wood reddish, close and even-grained, hard. Pores small, unequal, often subdivided; joined by close-set, concentric, reddish wavy, disconnected lines of softer tissue. Medullary rays fine, uniform. Weighs about 40 lbs. to the cub. ft. The timber is good but not used in North Kanara. In Bengal oil is expressed from the seeds. The bark is astringent

2. A. canarana, Benth and Hook. f. Gen. Plant. 1, 335; Fl. Br. I. 1, 560; Cooke Fl. Pres. Bomb. 1, 212.

A small or medium-sized tree; young parts densely brown-lepidote. Leaves abruptly-pinnate, 8″-1·5″ long, 5-7-foliate; petioles up to 6″ long; leaflets subopposite, or alternate; elliptic-acuminate, somewhat falcate, oblique at the base, thin, distinctly glandular-punctate, (glands unequal-sized, elongated), glabrous above, densely lepidote beneath when young, glabrescent in age, 3″-7″ by 1″-2·5″; petiolules ·25″ long; lateral-nerves about 10 pairs, distinct beneath. Flowers minute, ·05″ in diameter, globose in bud, in densely-flowered, pyramidal, supra-axillary panicles, shorter than the leaves; branches angular and densely lepidote; pedicels shorter than the flowers. Calyx cup-shaped, 4-toothed, densely lepidote. Corolla glabrous; petals 3-4, orbicular, deeply imbricate. Staminal-tube truncate; anthers 6, slightly exserted. Ovary nearly glabrous, 3-celled; cells 2-ovuled; stigma lobed. Fruit obovoid, ·7″ long.

Assam, Eastern Bengal, Silhet, Southern and Western India and Ceylon Konkan and North Kanara ghâts in rain-forests. Fl. May-July. Fr. Jan.-May. A medium-sized, smooth-barked tree. Wood reddish, smooth, very hard and close-grained Pores small, joined by short lines in the autumn wood and by more continuous fine white lines in the spring wood. Medullary rays very fine and close. Annual-rings visible. Weighs about 61 lbs. to the cub. ft. A strong timber not however much used in North Kanara.

3. A. cucculata, Roxb. Cor. Plant. III, 54, t. 258; Fl. Br. I. 1, 560; Dalz. & Gibs. Bomb. Fl. 37; Bedd. Fl. Sylv. 55; Gamble Ind. Timb. 151; Cooke Fl. Pres. Bomb. 1, 211.

Coasts of Bengal and Burma, Nepal and the Andamans; Parwar ghât, Bombay, Dalz. It is very doubtful whether this species is indigenous in the Bombay presidency at all; it is abundant in the littoral swamp-forests of Burmah and Bengal and there appears to be an error in Dalzell's statement that it is found on the Belgaum ghâts.

4. A. Lawii, Benth. Hook. f. Gen. Plant. 1, 335; Fl. Br. I. 1, 561; Cooke Fl. Pres. Bomb. 1, 212; Brandis Ind. Trees. 142; Bedd. Fl. Sylv. t. 133; *Nemedra Nimmonii*, Dalz and Gibs. Bomb. Fl. 37. *Madrasada,* K. *Buramb,* M.

A medium-sized tree; young parts, inflorescence etc. covered with yellowish-brown scales. Leaves 6″-9″ long, 3-5-foliate; leaflets alternate, narrow or broadly ovate, elliptic-lanceolate, long or shortly-acuminate, membranous, pallid, sometimes slightly unequal-sided at the base; lateral-nerves about 12 pairs, distinct beneath, hairy, glandular in the axils, 3″-6″ by 1·5″-2·25″; petiolules ·2″-·5″ long. Flowers small, ·15″ long, very shortly pedicelled, in axillary, much branched panicles, shorter than the leaves. Calyx short, truncate, very shallowly 4-toothed, densely lepidote. Petals 3-4, 3-times as long as the calyx, glabrous, imbricate,

veined. Anthers 7-9, included in the truncate staminal-tube. Ovary scaly, 3-celled; cells 1-ovuled; stigmas 3, sessile. Fruit ·5-·75″ long, obovoid, filled with resinous juice, indehiscent, densely yellowish-lepidote.

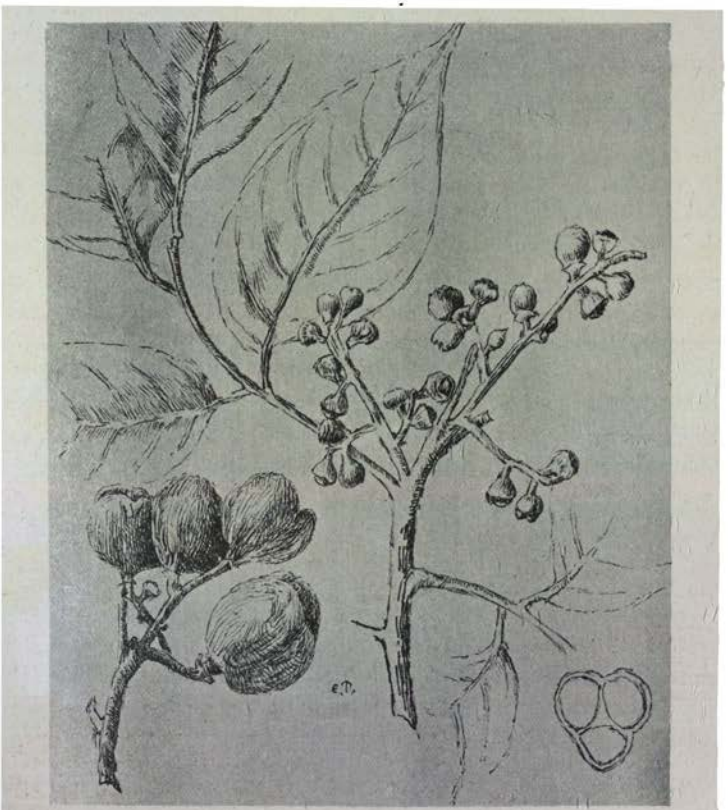


Fig 142. Amoora Lawii, Benth. & Hook.

Western Peninsula from the Konkan southwards common, sometimes gregarious in rain-forests; usually a medium-sized but often a fairly large tree with smooth grey bark. Fl. C. S. Fr. ripe R. S. Wood brick-red hard, compact, lustrous and even-grained. Pores small, unequal-sized in the heartwood, mostly closed and joined by irregular, concentric, close, short lines of red tissue. Medullary rays fine, numerous, white. Weighs 64 lbs. to the cub. ft. The timber is available in quantity in many parts of Kanara and Belgaum and appears worthy of attention.

9. WALSURA, Roxb.

Trees. Leaves 1-5-foliate; leaflets opposite, entire. Flowers small, hermaphrodite, in axillary or terminal panicles. Calyx 5-divided, imbricate. Petals 5, free, spreading, imbricate or sub-valvate. Filaments 8-10, free or connate into a tube; anthers 8-10, erect, exserted. Disk usually annular, fleshy. Ovary 2-3-celled, immersed in the disk; style short; stigma turbinate, capitate; cells with 2 collateral ovules in each. Fruit a fleshy berry, 1-seeded; seed enclosed in a fleshy aril, exalbuminous.

W. piscidia, Roxb. Fl. Ind. 2, 387; Fl. Br. I. 1, 564; Bedd. Fl. Sylv. 56; Dalz. & Gibs. Bomb. Fl. 37; Gamble Ind. Timb. 152; Cooke Fl. Pres. Bomb. 1, 213. *Walasura, wallursi,* Vern.

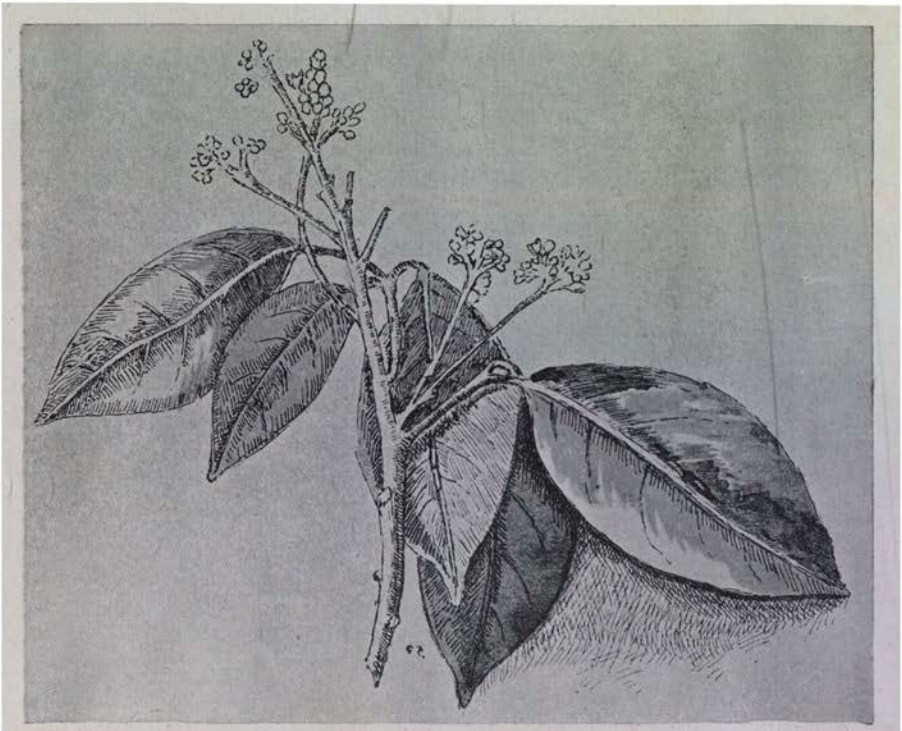


Fig 143. Walsura piscidia, Roxb.

A moderate-sized tree. Leaves alternate, trifoliate, 4″-8″ long; petioles about 1″ long; leaflets coriaceous, opposite, ovate, acuminate, equal-sided and

acute at the base, glabrous, shining above, glaucous beneath; lateral-nerves about 10 pairs, slender, distinct, 2·5″-5·5″ by 1″-2″; petiolules dilated at the top, lateral much shorter than the terminal. Flowers small, ·12″ in diameter; whitish-yellow, in dense, terminal, branched corymbs, shorter than the leaves; bracts minute, caducous. Sepals, short, ovate, acute, puberulous. Petals 4-times as long as the sepals, ovate, acute, puberulous, scarcely imbricate in bud. Stamens 10, free or slightly united at the base; filaments flattened, 2-toothed at the apex, pubescent above; anthers inserted between the teeth at the tops of the filaments, yellow. Ovary sunk in the thick, annular disk, 2-celled, pubescent; style very short, stout; stigma large, mitriform. Fruit ovoid, ·4″ long, 1-seeded, pulpy, downy, indehiscent.

Western Peninsula from the Konkan and North Kanara southwards to Travancore and dry parts of Ceylon. On the North Kanara and Belgaum ghâts in rain-forest, somewhat rare. Fl. Nov.-Dec. Fr. May-June.

A medium-sized tree with thin, ash-coloured, fissured bark. Wood hard, heavy, strong and close-grained; sapwood reddish brown; heartwood dark red, streaked with black. The numerous, small pores are joined by wavy concentric lines of tissue. Medullary rays very fine and numerous. Wood not used in North Kanara. Bark contains much tannin. Pulp of fruit used to intoxicate fish in the Madras presidency.

10. HEYNEA, Roxb.

Trees. Leaves 5-11-foliate, imparipinnate; leaflets opposite, entire. Panicles terminal and axillary, corymbose, long peduncled; peduncles and pedicels articulate. Flowers hermaphrodite. Calyx 4-5-fid. Corolla of 4-5, oblong petals. Staminal-tube 8-10-fid; divisions linear, bidentate at the apex; anthers between the linear teeth. Disk annular, fleshy. Ovary immersed in the disk, 2-3-celled; ovules 2 in each cell; stigma with a thickened ring at the base. Fruit capsular, 1-celled, 2-valved, 1-seeded. Seed enclosed in an arillus, exalbuminous; cotyledons hemispherical, thin, white.

H. trijuga, Roxb. Fl. Ind. 2, 390; Fl. Br. I. 1, 565; Dalz. & Gibs. Bomb. Fl. 38; Brandis For. Fl. 70; Cooke Fl. Pres. Bomb. 1, 214; Gamble Ind. Timb. 152; *H. affinis,* Juss.; Bedd. Fl. Sylv. t. 134. *Kora, kuriya, tural, doddagli maddu,* K. *Gundira,* M.; *Limbara,* Vern.

A moderate-sized tree. Leaves imparipinnate, 12″-20″ long; leaflets 3-4 pairs (with a long-petioluled terminal leaflet), ovate-oblong, long-acuminate, glabrous, unequal-sided at the base, white glaucous beneath, 4″-8″ by 2·5″-3·5″; petiolules ·25″-·5″; terminal petiolule 1″-1·5″ long; principal lateral-nerves about 8 pairs, distinct and looping within the margin. Flowers small, white, ·15″ in diameter,

in long-peduncled panicles, usually shorter than the leaves. Calyx short, pubescent. Petals linear-oblong. Staminal-column split for about $\frac{2}{3}$ of its length into linear, toothed-lobes, pubescent; anthers between the teeth of the lobes, yellow, obtusely apiculate. Ovary glabrous; style obconical; stigma 2-dentate, thickened at base. Capsule globose, ·5″ in diameter, bursting into 2 valves, disclosing the seed covered with its thin, white arillus; testa orange-coloured when fresh afterwards light-brown.

Fig 144. Heynea trijuga, Roxb.

Widely spread throughout the moist forests of India from the Himalayas southwards to Ceylon, Western ghàts in monsoon and rain-forest Nilghiris up to

6000′. In the Bombay Presidency, common in fringing forests along the banks of rivers in North Kanara, also in rain-forest, often cultivated. Fl. Feb.-March. Fr. ripe in the cold season Oct.-Feb.

Bark thin, ash-coloured, covered with angular depressed lenticels. Wood yellowish-white, smooth, moderately hard. Pores medium-sized, often divided or in small groups, joined by broken, irregular bands of white tissue. Medullary rays moderately broad, numerous. Weighs 42 lbs. to the cub. ft. Wood not used in North Kanara. Bark and leaves contain a bitter, astringent substance. An oil used for burning is extracted from the seeds in Nepal.

11. CARAPA, Aubl.

Trees. Leaves 2-6-foliate; leaflets opposite, entire. Panicles axillary, lax. Calyx 4-fid. Petals 4, reflexed. Staminal-tube urceolate, globose, 8-dentate at

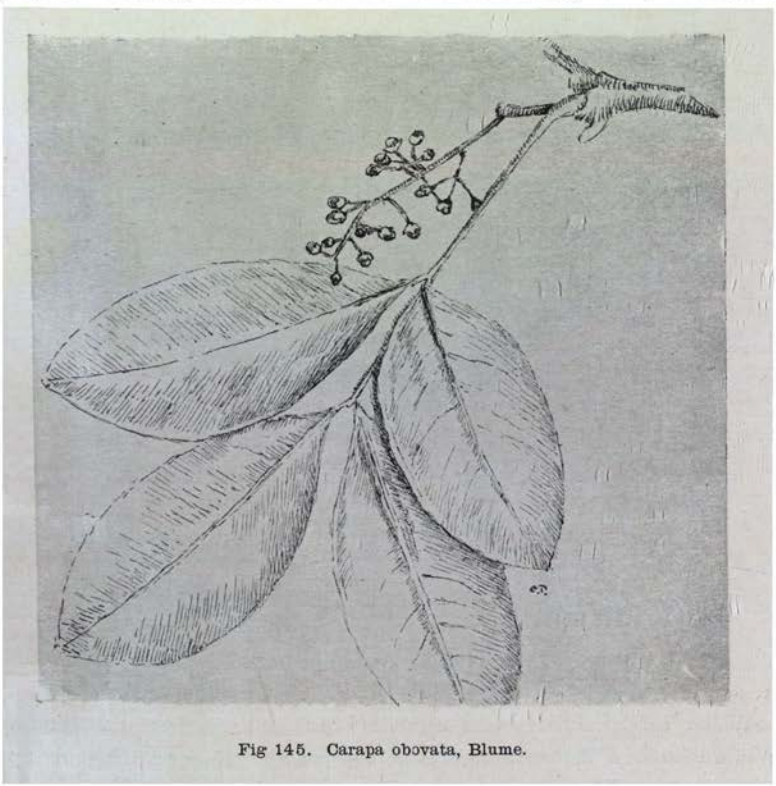


Fig 145. Carapa obovata, Blume.

the apex; teeth bipartite; anthers 8, 2-celled, included, sessile. Disk fleshy, cup-shaped, at the base of the ovary and adherent to it. Ovary 4-celled, 4 sulcate; cells 2-8-ovuled; style short; stigma discoid. Fruit a globose capsule, 3″-4″ in diameter, 6-12-seeded. Seeds large, angular, exarillate; testa hard, spongy; hilum large, ventral; cotyledons amygdaloid.

C. obovata, Blume, Bijdr. 179; Cooke Fl. Pres. Bomb. 1, 213; *C. moluccensis,* Lam. Encycl. Meth. 1, 621; Fl. Br. I. 1, 567 (in part); Bedd. Fl. Sylv. t. 136; Gamble Ind. Timb. 1, 153.

A small, littoral, evergreen tree. Leaves paripinnate, 3″-6″ long; leaflets 1-2 pairs, opposite, glabrous, coriaceous; blade 3″-4″ by 1·5″-1·75″, obovate, obtuse or bluntly acuminate and nearly equal-sided at the base; petioles very short. Flowers axillary, in lax, few-flowered panicles, shorter than the leaves. Calyx 4-fid; divisions broad. Petals yellowish, elliptic, ·25″ long. Staminal-tube shorter than the petals; anthers included. Ovary ovoid; style conical; stigma large, discoid. Fruit globose, 3″-4″ in diameter; seeds angular; testa hard, spongy.

Sea-coasts of Bengal, Malabar, Konkan, Burmah and Ceylon in Mangrove swamps. Yields a brown bitter gum-resin. Bark bitter and astringent contains much tannin. Used in native medicine. Wood white, turning red on exposure, hard. Weighs 45-50 lbs. to the cub. ft. Sir D. Brandis is of opinion that *C. moluccensis,* Ham. is distinct from *C. obovata,* Bl. and that the latter is probably the W. Peninsular species, the former being confined to Malaya, Australia and East Africa.

12. SOYMIDA, Adr. Juss.

A tree. Leaves paripinnate; leaflets opposite, entire. Flowers greenish-white, in axillary or terminal panicles. Sepals 5, short, imbricate. Petals 5, free, spreading, unguiculate. Staminal-tube short, cup-shaped, 10-lobed; lobes bidentate; anthers sessile between the teeth, short. Disk flat. Ovary 5-celled; cells many-ovuled; style short; stigma broad, fleshy. Capsule woody, 5-valved. Seeds imbricate in two series, numerous, winged at both ends, albuminous; cotyledons foliaceous, 2-auricled at the base; radicle superior.

S. febrifuga, Adr. Juss. in Mem. Mus. XIX. 251. t. 20. f. 26; Fl. Br. I. 1, 567; Brandis For. Fl. 71; Bedd. Fl. Sylv. t. 8; Dalz. & Gibs. Bomb. Fl. 38; Gamble Ind. Timb. 155; Cooke Fl. Pres. Bomb. 1, 215. *Bastard Cedar; Indian Redwood. Rohan, lal-chundan, rainyi,* Vern.; *Palara,* M.; *Suami,* K. *Reni,* Bhil.

A lage or medium-sized, glabrous tree. Leaves 9″-12″ long; petioles 1″-2″ long, thickened at the base; leaflets 3-6 pairs, glabrous, conspicuously nerved, pale, elliptic or oblong, obtuse at the apex, oblique at the base; blade 4·5″-2″ by 2·5″-1″; petiolules short or O. Panicles large, terminal, or axillary, branched, equalling or sometimes exceeding the leaves. Flowers hermaphrodite, small, ·12″ in diameter; bracts triangular. Calyx deeply 5-cleft; margins membranous. Petals obovate, 25″ long, unguiculate. Staminal-tube ½ the length of the petals urceolate. Ovary glabrous; stigma discoid, 5-lobed. Capsule smooth, black when ripe, 1″-2″ long, 5-celled, 5-valved.

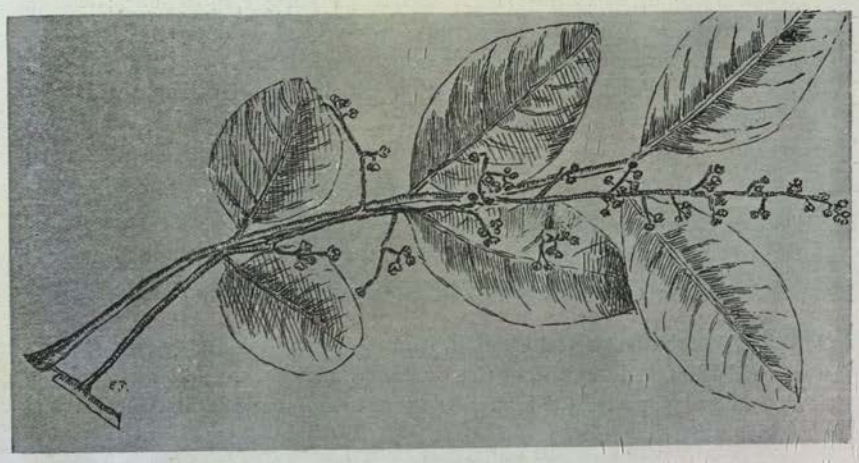


Fig 146. Soymida febrifuga, Adr. Juss.

N. W. Central and Southern India, Western peninsula and Ceylon, Guzerat, Khandesh on the Satpudas, Belgaum and Dharwar districts; usually in open situations on dry, stony hills. Young foliage and flowers appear in April and May before the old leaves have all fallen. Fruits during July and August. Bark dark, rough, exfoliating in large plates or scales. Sapwood small, whitish; heartwood very hard, close-grained, dark-red coloured, durable, with fine closely packed concentric lines of lighter coloured tissue. Medullary rays moderately broad. Pores medium-sized, few. Weighs about 74 lbs. to the cub. ft. Used for building purposes, well-work, ploughshares, etc. has a silvery grain and takes a fine polish, is an excellent durable timber well adapted for ornamental furniture. The bitter bark is sometimes used for tanning also as a native febrifuge. Yields a transparent gum like gum-arabic from wounds in the trunk. The inner-bark contains a strong red fibre made into ropes.

13 CHICKRASSIA, ADR. JUSS.

A large tree. Leaves paripinnate; leaflets acuminate, oblique. Flowers hermaphrodite, in terminal panicles. Calyx 5-divided. Corolla of 5, free, erect,

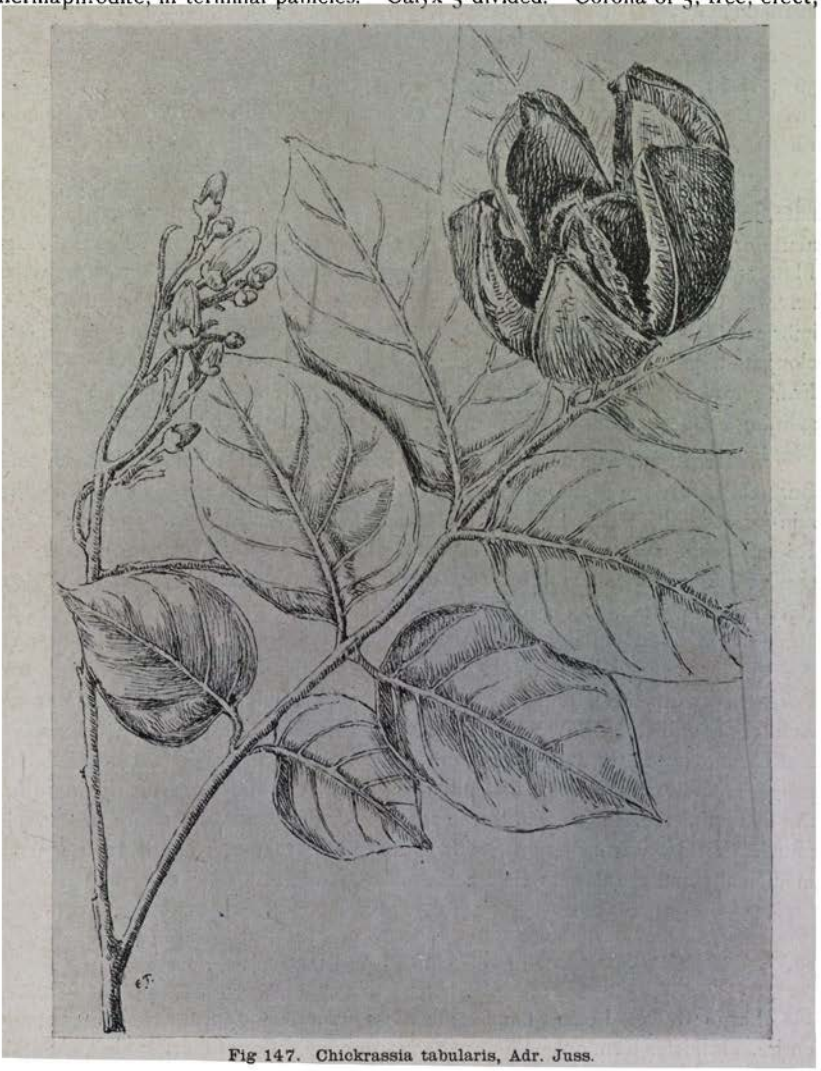


Fig 147. Chickrassia tabularis, Adr. Juss.

contorted petals. Staminal-tube cylindric, 10-crenate; anthers 10, erect, between

the crenatures, exserted. Disk O. Ovary 3-5-celled; cells multi-ovulate; ovules biseriate. Fruit a 3-4-celled, septicidally 3-4-valved capsule; valves consisting of 2 plates, separating from the 3-winged axis. Seeds numerous, winged below, exalbuminous; cotyledons orbicular, unequal-sided.

C. tabularis, Adr. Juss. in Mem. Mus. XIX, 251. t. 22. f. 27; Fl. Br. I. 1, 568; Bedd. Fl. Sylv. t. 9; Gamble Ind. Timb. 156; *Chukrassia tabularis,* Adr. Juss.; Cooke Fl. Pres. Bomb, 1, 216; *C. Nimmonii,* Grah; Dalz. & Gibs. Bomb. Fl. 38. *Chittagong Wood Tree; Lal devdari, pabba,* M.

A large, deciduous tree. Leaves alternate, 6″-18″ long; leaflets 10-16, alternate, more or less velvety or nearly glabrous, ovate or obliquely ovate, oblong, acute or acuminate, oblique at the base, 2″-5″ by 1·25″-2·75″; petiolules ·25″ long. Flowers white, ·6″ long, in panicles with spreading branches and shorter than the leaves. Calyx short, puberulous, about ·1″ long. Petals linear-ovate, spathulate, imbricate, about ·6″ by ·12″ long. Staminal-tube cylindric, glabrous. Ovary elongated, pubescent; stigma on a level with the mouth of the staminal-column. Fruit an ovoid capsule, 2″ by 1·5″ 3-5 often 4-celled; segments of the pericarp splitting at the tips during dehiscence; seeds winged, 1·5″ by ·5″.

Western Peninsula from the Konkan southwards, Ceylon, E. Bengal, and Burmah. Both the glabrous and villous varieties of this tree are common in the rain-forests of North Kanara and the Konkan. The villous variety (*C. velutina,* Roem.) has usually a 4-5-valved capsule. Fl. Mch.-Apl. Fr. Aug.-Sept. A fine tree with a cylindrical trunk 60′-80′ to the first branch and 14′ in circumference. Bark dark-coloured, narrowly longitudinally fissured with short, horizontal cracks and a scaly rhytidome about ·25″ thick; inner-bark ·5″ thick, reddish, fibrous, in concentric rings. Wood scented, hard, yellowish-brown, with a satiny lustre. Pores moderate-sized, uniformly distributed. Medullary rays fine, numerous. Annual-rings distinct. Weighs about 50 lbs. to the cub. ft. Takes a fine polish and is suitable for furniture, woodwork of railway carriages, panelling, building purposes and for carving. It is much sought after in parts of North Kanara for the houses of the Haigas who live in the vicinity of the forests, where this tree is found. Yields a transparent yellow gum. The very astringent bark is used medicinally and the flowers yield a red and yellow dye.

14. CEDRELA, Linn.

Large trees. Leaves pinnate; leaflets numerous, opposite, oblique, usually entire. Panicles terminal. Flowers hermaphrodite. Calyx short, 5-cleft. Petals ovate, imbricate, free. Stamens 4-6, free, inserted on the top of the disk, sometimes alternating with staminodes. Disk 4-6-lobed. Ovary sessile on the

disk, 5-celled; cells with 8-12, biseriate ovules; style filiform; stigma discoid. Capsule 5-celled; seeds winged; cotyledons flat, sub-foliaceous.

C. Toona, Roxb. Fl. Ind. 1, 635; Fl. Br. I. 1, 568; Bedd. Fl. Sylv. t. 10; Dalz. & Gibs. Bomb. Fl. 38; Brandis For. Fl. 72; Cooke Fl. Pres. Bomb. 1, 217; Gamble Ind. Timb. 157. *Indian Mahogany; Moulmein Cedar* or *Toon Tree. Todu, maha-nim, tuni, huruk,* M.; *Tundu, devdari,* K.

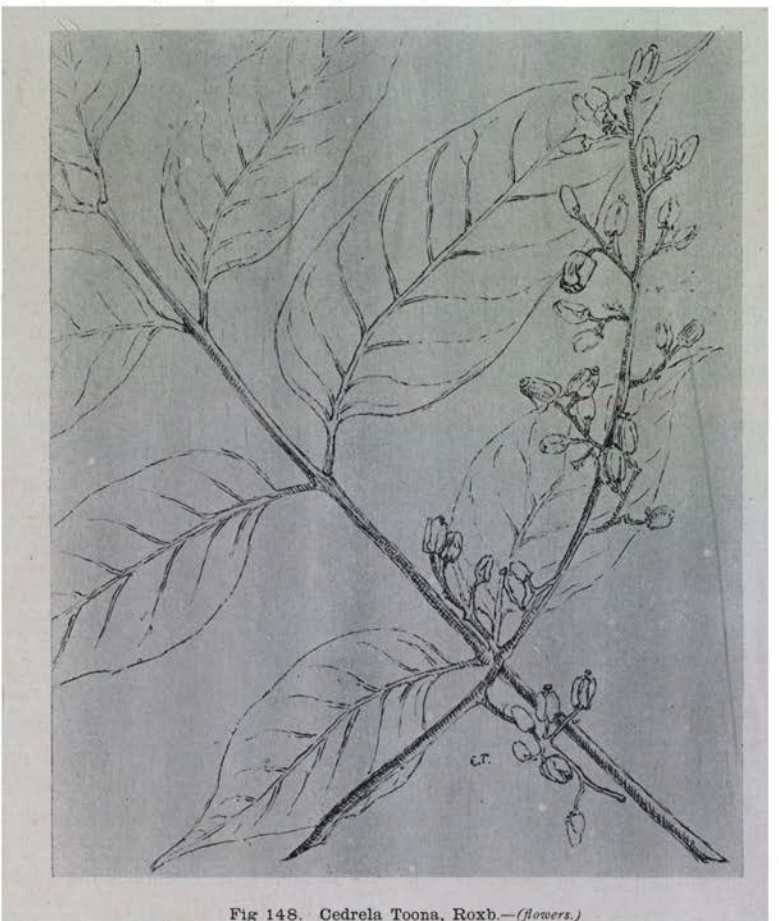


Fig 148. Cedrela Toona, Roxb.—*(flowers.)*

A large, deciduous, glabrous tree. Leaves abruptly-pinnate, 12″-18″ long; leaflets 10-20, usually opposite, lanceolate or ovate-lanceolate, acuminate or cuspidate, more or less undulate or entire, membranous; blade 2·5″-5″ by 1·5″-2″;

petiolules slender, ·25″-·5″ long. Flowers small, white, in terminal panicles, as long as or shorter than the leaves; pedicels slender, ·1″ long. Calyx glabrous; lobes obtuse; margins ciliate. Petals oblong, ciliate. Stamens 5, inserted on the 5, fleshy, orange-coloured, pilose lobes of the disk. Staminodes O. Ovary hairy, ovoid; stigma 5-lobed, peltate. Capsule ovoid, or oblong, ·75″-1″ long, rough with raised white spots; valves coriaceous, dehiscing septifragally from the apex, and separating from the dissepiments which remain as a pentagonal, pithy column. Seeds numerous, pendulous, flat, imbricate, winged at both ends or less so on the outer margin.

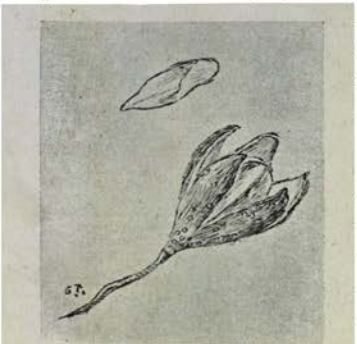


Fig 149. Cedrela Toona Roxb—*(fruit.)*

Sub-Himalayan forests, Burma, Bengal, Oudh, Southern and Western India; ascending to 6000′ in the Nilghiris; more or less abundant in the evergreen rain and monsoon-forests of the Konkan and North Kanara. In the dry forests of the Akrani, Khandesh; ascends to 3700.′ Fl. Jan. Fr. March.-Apl. Bark dark-grey about ·5″ thick, exfoliating when old in irregular, woody scales; inner-bark red. Wood brick-red, soft, shining, open-grained, fragrant, readily seasons, does not warp or split. Annual-rings marked by a ring of large pores. Medullary rays red, fine and broad. Suitable and much used for tea-boxes in Bengal, also for furniture, carving and building purposes (door panels); makes excellent cigar boxes. Possesses a fragrant odour, particularly when freshly cut. Yields a resinous gum. A red and yellow dye obtained from the flowers is adapted for colouring silken fabrics.

15. CHLOROXYLON, DC.

A tree. Leaves abruptly-pinnate; leaflets many, unequal-sided. Flowers small, bisexual, in terminal or axillary panicles. Calyx. 5-divided. Petals 5, clawed, imbricate. Stamens 10, alternately longer and shorter, inserted outside the base of the disk; filaments filiform; anthers versatile. Disk thick, 10-lobed, pubescent. Ovary pubescent, immersed in the disk, 3-lobed and celled; ovules 8 in each cell; style short, slender; stigma capitate. Capsule 3-celled, loculicidally 3-valved. Seeds imbricate, winged; albumen O; cotyledons plano-convex.

C. Swietenia, DC. Prodr. 1, 625; Fl. Br. I. 1, 569; Bedd. Fl. Sylv, t. 11; Dalz. & Gibs. Bomb. Fl. 39; Brandis For. Fl. 74; Cooke Fl. Pres. Bomb. 1, 218; Gamble Ind. Timb. 160. *Mashwal,* K. *Halda, billu,* M. *Satinwood.*

A small tree with a straight, symmetrical trunk; young parts, inflorescence etc. covered with grey pubescence. Leaves aggregated at the ends of the branches, about 8″ long; leaflets 20-40, obliquely-oblong, unequal-sided, almost falcate, obtuse, about 1″ long, pale and dotted beneath. Flowers small, in terminal and axillary panicles; pedicels longer than the flowers; bracts small, deciduous Calyx short, 5-partite; lobes ovate. Petals ·20″ long, ovate, acute, sagittate at the base, pubescent outside. Stamens inserted between the lobes of the disk shorter than the petals. Ovary immersed in the disk, 3-lobed, pubescent. Capsule 1″ long, dark-brown when ripe. Seeds with a broad wing at one end.

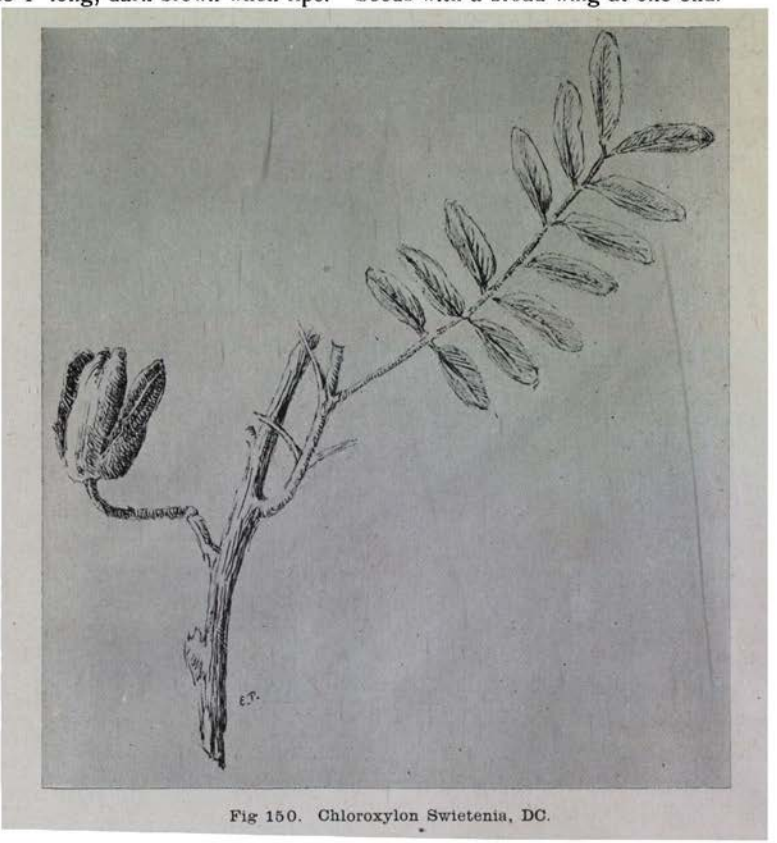


Fig 150. Chloroxylon Swietenia, DC.

Central, Southern India and Ceylon; common on the Satpudas and the drier parts of the Bombay Presidency; abundant on sandstone formations both in the Kaladgi and Belgaum districts. In the Madras presidency Beddome mentions stems 8′ in girth and even larger trees are found in Ceylon. In

Bombay however it is always small and scarcely yields wood of marketable dimensions. The fresh foliage appears in May. Fl. Mar.-Apl. Fr. Apl.-Oct. Bark yellow, fissured, soft, corky, about ·5″ thick. Wood hard, durable, yellowish-brown, fragrant, with a fine satiny lustre, the beautiful satinwood of commerce. Annual-rings distinct. Seasons well. Weighs about 60 lbs. to the cub. ft. Very strong, (P. varying between 600 and 1059.) An excellent wood for turning; used for railway sleepers, agricultural implements, carts, furniture and picture-frames; exported to England for cabinet work and backs of brushes; apparently resists the attacks of Teredo navalis. *"Flower satin"* is obtained from the roots in Ceylon. Yields a yellow dye, also a wood oil. Not a good firewood as it smokes too much.

Order XXVII.—CHAILLETIACEÆ.

Small trees or shrubs. Leaves alternate, entire; stipules 2, petiolar, deciduous. Flowers small, hermaphrodite or unisexual, in axillary, corymbose cymes. Sepals 5, free or connate, imbricate. Petals 5, free, equal or unequal, notched or 2-fid, often with an inflexed lamina adnate to the limb of the petal, usually open in æstivation. Stamens 5, free or adnate to the corolla. Disk of 5 glands or scales or a glandular or lobed cup. Ovary free, 2-3-celled; ovules 2 in each cell, pendulous from the top; styles 1-2-3, free or more or less connate; stigmas simple or capitate. Drupe pubescent, 2-celled, compressed. Seeds solitary; albumen O; embryo large; cotyledons thick; radicle small, superior.

Chailletia sumatrana, Miq. Fl. Ind. Bot. Suppl. 328 (1860); Cooke Fl. Pres. Bomb. 1, 219; Trimen Fl. Ceylon 1, 254; *C. gelonioides,* Hook. f. in Gen. Plant. 1, 321; Fl. Br. I. 1, 570; Bedd. Fl. Sylv. 59; Gamble Ind. Timb. 162; *Moacurra gelonioides,* Roxb.; Dalz. and Gibs. Bo. Fl. 52; *Bodingin gidda,* K.

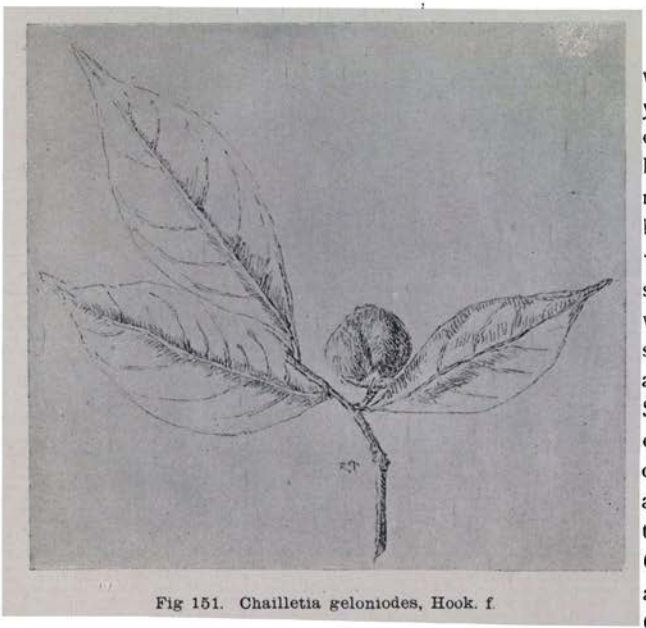


Fig 151. Chailletia geloniodes, Hook. f.

A small shrub with few branches; young parts pubescent. Leaves glabrous, ovate, acuminate, entire, 4″-1″ by 1·75″-·6″; petioles ·2″ long. Flowers small, densely white-pubescent, in short-peduncled, axillary clusters. Sepals obtuse, concave. Petals linear-oblong as long as or a little longer than the calyx, bifid. Connective of anthers dilated. Ovary woolly; styles 2, recurved. Fruit dehiscent, 2-valved, densely tomentose, flattened-or

bicular, didymous or obcordate; stone hard, rugose, enclosed completely in a scarlet mesocarp.

Eastern Bengal at the foot of the Khasia Mts. Silhet and Chittagong, Western Peninsula on the ghâts from the Konkan southwards. Ceylon ascending to 3000′. Abundant in the rain-forests of N. Kanara, near the Falls of Gairsoppah but never anything more than a tall slender shrub with very few branches. Fl. Dec.-June. Fr. Aug.-Dec. Gamble describes the wood of specimens in the Kew Museum collected by Sir I. Hooker in the Khasia Hills as somewhat resembling that of the Oak with fine and broad medullary rays giving the appearance of a silvery grain.

Order XXVIII.—OLACACEÆ.

Trees or shrubs, sometimes climbing. Leaves simple, usually alternate, exstipulate. Inflorescence cymose or racemose. Flowers regular, hermaphrodite or unisexual, usually small. Calyx 4-5-toothed, sometimes accrescent, free or adherent to the fruit. Petals 3-6, valvate or imbricate, free or more or less coherent. Stamens equal to or twice as many as the petals; all fertile or some without anthers. Disk cup-shaped, free or adnate to the ovary or to the calyx. Ovary free or immersed in the disk, 2-3-celled; ovules 1-5, pendulous from the apex of a central placenta or from the side or apex of the ovary; funicle often dilated above the ovule. Fruit usually an indehiscent drupe. Seed pendulous; albumen fleshy or O; radicle superior; cotyledons leafy, flat or folded, rarely fleshy. A somewhat extensive order of small economic importance to the forester.

Stamens and petals unequal in number.

Fertile stamens 10. Calyx not enlarged in fruit ... 1. Ximenia.

Fertile stamens 3-5. Calyx enlarged in fruit ... 2. Olax.

Stamens 5, rarely 4, equal and *opposite* to petals

Calyx and corolla present. Ovules 1-5; embryo minute. Corolla dialypetalous.

Cirrhose shrubs. Epicarp separating from fruit in reflexed valves ... ... 3. Erythropalum.

A large tree. Epicarp not separating from fruit. 4. Strombosia.

Calyx O.

Climbing shrubs, sometimes spiny.
Corolla gamopetalous. Embryo with 2 long cotyledons ... ... 5. Cansjera.

Stamens equal to petals and *alternate* with them

Flowers not fœtid. Petals usually glabrous.

Erect shrubs or trees.

Anthers pendulous, not sagittate.
Ovary centric; stigma discoid ... ... 6. Gomphandra.

Anthers basifixed, sagittate
Ovary oblique; stigmas small ... ... 7. Apodytes.

Climbing shrubs.
Anthers erect. Stigmas sessile ... ... 8. Sarcostigma.
Flowers fœtid. Petals hairy within ... ... 9. Mappia.

1. XIMENIA, LINN.

A straggling shrub or low tree; branches often ending in a spine. Leaves alternate, simple. Flowers racemose, bisexual or polygamous. Calyx cupular, 4-5-toothed, persistent. Petals 4-5, revolute, bearded within. Stamens twice the number of the petals; staminodes O. Ovary sessile, 3-celled at base; ovules 1 in each cell, pendulous; style columnar. Drupe ovoid with a fleshy sarcocarp, 1-seeded.

X. americana, Willd. Sp. Pl. 2, 230; Fl. Br. I. 1, 574; Gamble Ind. Timb. 163; Cooke Fl. Pres. Bomb. 1, 220; *False Sandalwood. Nekri,* K.

Leaves turn black in drying, coriaceous, glabrous, 1-nerved, ovate or rounded, obtuse at both ends, emarginate, 1″-2″ by ·5″-1·5″; petioles ·25″ long. Flowers white, fragrant, ·3″ in diameter, in short, axillary racemes or on the ends of thickened shoots; bracts minute. Calyx glabrous, deeply divided; lobes 5, ovate, acute, at length reflexed. Petals hairy within, much longer than the calyx. Stamens equal in length to the petals; connective broad. Ovary sessile, sulcate, 4-celled. Fruit a pulpy, 1-seeded drupe greenish-red, turning yellow or orange-red when ripe, about the size of a cherry; stone crustaceous.

Eastern and Western Peninsulas. Andamans, Ceylon (rare), Malay Archipelago and Tropical Africa. A littoral or inland tropical species. In the dry parts of the Belgaum, Bijapore and Dharwar districts of the Bombay Presidency; common on the sandstone formation near Sutguttee, Belgaum, Fl. and Fr. at different times apparently. I have found it so both in January and during May.

A species of variable habit, either a spinous erect or climbing scandent shrub. Stems 6″ in diameter are not uncommon. Bark rough, blackish, or dark-grey, ·5″ thick; inner-bark bright-red, consisting principally of soft bast. Wood yellow, like sandalwood and used as a substitute for true sandalwood by the natives on the Coromandel Coast. Gamble. Wood (from Belgaum district) yellowish-brown; heartwood much darker, smooth, close-grained, hard. Pores very small and numerous. Medullary rays fine, short. Weighs about 50 lbs. to the cub. ft. The ripe fruit is edible.

2. OLAX, LINN.

Shrubs or small trees, usually scandent. Leaves alternate, simple. Flowers in axillary racemes or panicles. Bracts minute. Calyx small, cup-shaped, greatly

enlarging after flowering. Petals 5-6, valvate, more or less cohering. Fertile stamens usually 3, rarely 4-5; staminodes 5-6, bifid; anthers versatile. Ovary half-immersed in the disk, 3-celled at the base, 1-celled above; style simple, terminal; stigma 3-lobed; ovules 3, linear, pendulous from the apex of the central placenta. Fruit drupaceous, more or less covered by the accrescent calyx; stone crustaceous, 1-celled, 1-seeded. Seed inverse, albuminous; embryo minute, in the apex of the albumen; radicle superior.

Woody climbers.

Spinous. Branches pubescent.	Flowers ·25″ long..	1. O. scandens.
Unarmed. Branches glabrous.	Flowers ·5″ long...	2. O. Wightiana.

A small erect, undershrub ... ... 3. O. nana.

1. O. scandens, Roxb. Fl. Ind. 1, 163; Fl. Br. I. 1, 575; Brandis For. Fl. 75; Cooke Fl. Pres. Bomb. 1, 221; Trimen. Fl. Ceylon. 1, 256; Gamble Ind. Timb. 163.

A large, rambling or climbing shrub, prickly on the old branches. Leaves elliptic, or ovate-oblong, obtuse, distichous, glabrous or puberulous beneath; blade 2″-3″ by 1″-1·5″; petioles ·12″-·25″ long. Flowers ·25″ long, white, sweet-scented in short, axillary racemes; pedicels short; bracts ovate-oblong, as long as the pedicels, pubescent, caducous. Calyx cup-shaped, truncate, ciliate. Petals linear, irregularly cleft. Ovary ovoid, glabrous; style linear; stigma 3-lobed. Fruit globose, yellow, enclosed except at the top by the accrescent calyx, ·4″ in diameter.

S. India, Ceylon, Burmah and the W. Himalayas, Satpudas. I can find no record of this climber having been found in the Bombay Presidency, and have never observed it myself in the Khandesh Satpudas. Cooke in his Fl. Bomb. Pres. 1, 221 states its having been found in N. Kanara (Nilkund) and on the Khandala ghâts by Mr. Woodrow. The specimens collected by Woodrow from Khandala in the Poona College of Science Herbarium are all *O. Wightiana,* Wall. It flowers during the cold season, and possesses a white, soft, porous wood which weighs 36-40 lbs. to the cub.-ft.

2. O. Wightiana, Wall. Cat. 6779; Fl. Br. I. 1, 575; Dalz. & Gibs. Bomb. Fl. 27; Bedd. Fl. Sylv. 60; Cooke Fl. Pres. Bomb. 1, 221; Brandis Ind. Trees 148 *O. scandens,* W. & A; Grah. Cat. 22; Trimen. Fl. Ceylon 1, 256. *Gendgisa,* K.

A large, unarmed scandent climbing shrub. Leaves alternate, shining, glabrous above, paler beneath, ovate, bluntly acuminate, 2″-5″ by 1″-2″; petioles about ·25″ long. Racemes axillary, simple or compound, 1″-2·25″ long, many-flowered; bracts small or minute, very caducous. Calyx small, yellow, truncate,

cupular, puberulous or glabrous. Petals 5, lanceolate, acute, ·5″ long, caducous. Fertile stamens 3; anthers sagittate; staminodes 3-5, entire or bifid. Ovary ovoid; style narrowed into a capitate, deeply 3-lobed stigma. Fruit ovoid, ·5″ long, nearly covered by the truncate, yellow calyx; albumen pear-shaped; embryo minute, situated in the apex, of the seed; pedicels ·5″ long Both the bracts and petals are very caducous.

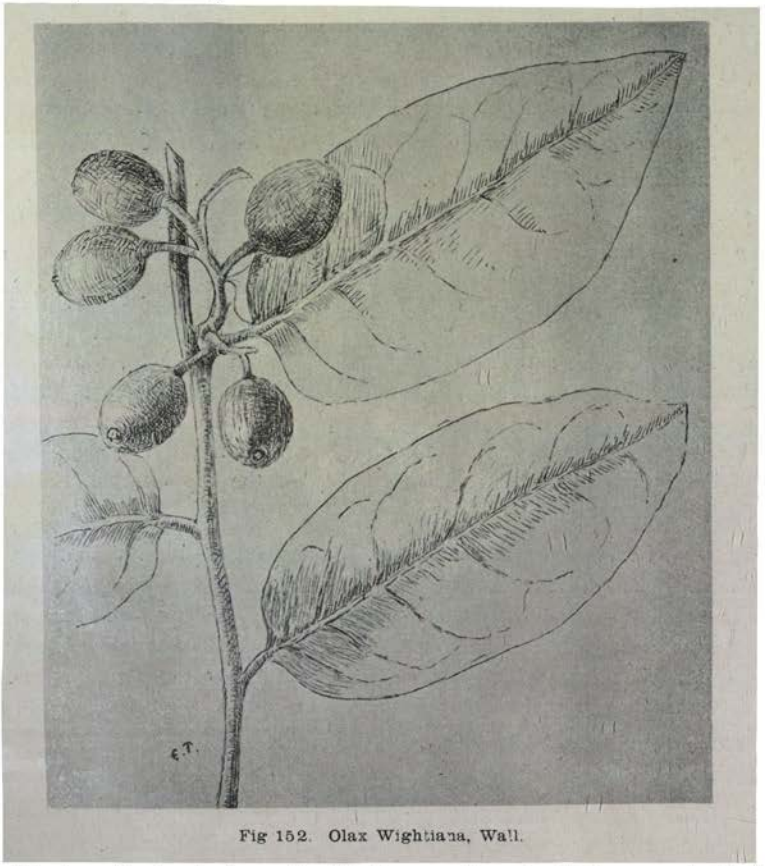


Fig 152. Olax Wightiana, Wall.

Western Peninsula from the Konkan southwards, Malacca and Ceylon. The Var. *bracteata,* is common in the evergreen rain-forests of North Kanara, from Ainshi southwards. Fl. Jan.-Feb. Fr. ripe April and May. Wood white with a yellowish tinge, soft, even-grained. Pores large, numerous, smaller and less numerous towards the centre of the stem. Medullary rays fine, wavy, indistinct. Weighs 45 lbs. to the cub. ft.

3. Olax nana, Wall. Cat. is a low undershrub, branched from a woody rootstock with subsessile, lanceolate leaves. Flowers on axillary slender peduncles and with a small globose fruit ·25″ in diameter, recorded from Guzerat, Kathiawar near Rajkote (C. Macnaghten,) N. W. Himalaya ascending to 5000′, Panjab and Nepal.

3. ERYTHROPALUM, Bl.

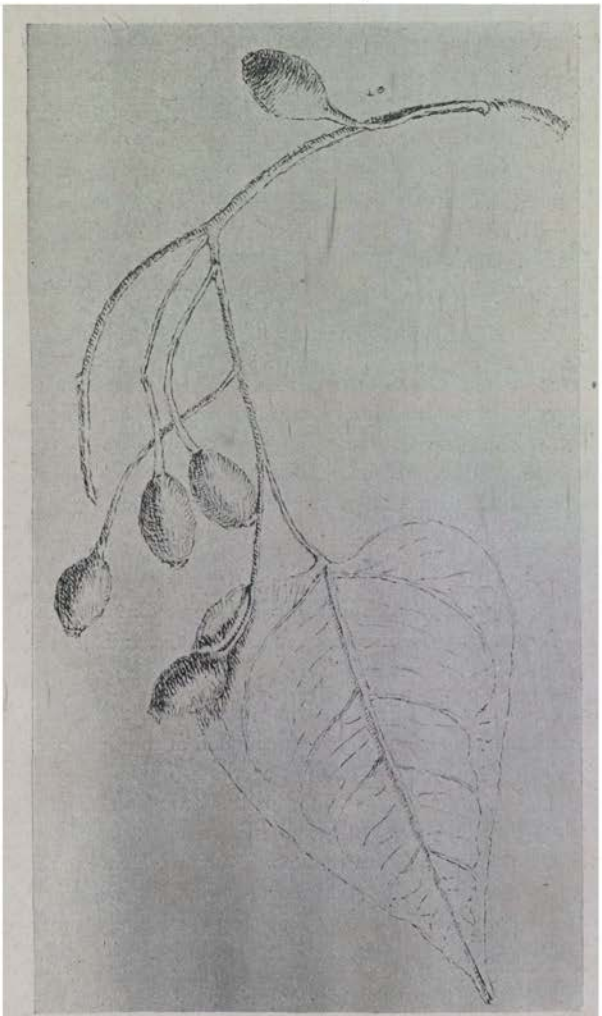


Fig 153. Erythropalum populifolium, Mast.

Climbing cirrhose shrubs with axillary tendrils. Leaves simple, alternate, palminerved. Peduncles axillary; ultimate pedicels umbellate. Flowers hermaphrodite. Calyx-limb 4-5-lobed. Corolla rotate, campanulate, 5-lobed; lobes valvate. Stamens 5, opposite the petals; anthers incurved; connective thick; staminodes 5. Disk epigynous. Ovary obconic, superior or partly inferior, 1-celled; ovules 1-3. pendulous, naked; stigma minute, 3-lobed. Fruit fleshy; epicarp separating in reflexed valves. Seed 1, pendulous; albumen firm; embryo minute.

E. populifolium, Mast. Fl. Br. I. 1, 578; Brandis Ind. Trees, 148.

A climbing shrub with smooth, green, tough branches. Leaves alternate, glabrous, broad, ovate-acuminate, cordate or truncate at

the base, peltate, with 3 prominent, basal-nerves, thinly coriaceous, shining above, pale beneath; blade 4″-5″ by 3″-3·5″; petioles 1″-2·5″ long. Tendrils (arrested peduncles) tough, bifid, slender. Inflorescence axillary, of 1-several, slender, dichotomous, few-flowered peduncles; pedicels long, slender. Calyx cup-shaped, obscurely 5-toothed. Corolla rotate, deeply 5-lobed; lobes oblong, much longer than the calyx. Disk epigynous. Ovary ovoid; style short; stigma trifid, minute. Fruit ellipsoid, ·75″ long; epicarp rather thick, yellow, when ripe deep-red and divided from the top into 5, reflexed segments, disclosing the bright blue, soft, fleshy arillus; endocarp crustaceous; albumen firm; embryo minute at the apex of the seed.

Western Peninsula from the Dodmune ghât of North Kanara southwards to Travancore. I have only met with this rare species in rain-forest near the Dodmune ghât where it is locally abundant. The pendant fruits with their reflexed valves, slender pedicels, thickened at the tops, and the bright blue arillate covering to the seeds are very ornamental. Fl. Nov.-Dec. Fr. Mar.-May.

4. STROMBOSIA, Blume.

Trees or shrubs. Leaves simple, alternate, quite entire. Inflorescence in short cymes. Flowers small, regular, hermaphrodite. Calyx cup-shaped, inferior or partly superior. Petals 5, valvate, hairy within. Stamens 5, opposite to the petals and adnate to their base. Ovary half-immersed in the disk, 3-5-celled; ovules 4-5, pendulous from a central placenta; style simple. Disk 5-lobed, perigynous. Fruit a drupe with a crustaceous stone. Seed pendulous; embryo minute; albumen fleshy.

Strombosia leprosa, Talb.; Jour. Bo. Nat. Hist. Soc. XI, 235; Gamble Ind. Timb. 1, 164; *S. ceylanica*, Cooke Fl. Pres. Bomb. 1, 223. Brandis. Ind. Trees, 148; *Sphærocarya leprosa*, Dalz. & Gibs. Bomb. Fl. 223.

A medium-sized or large evergreen tree with white, scaly bark. Leaves glabrous, shining, thinly coriaceous, pale beneath, ovate, rounded at the tip, sometimes oblique at the base; blade 3″-6″ by 1·5″-3″; lateral-nerves 4-6 pairs, distinct beneath; petioles ·5″-·75″ long. Flowers small, white, pentamerous, in axillary fascicles or on woody tubercles; buds globose. Calyx-lobes more or less indistinct ciliate. Petals ·12″ long, valvate, hairy within at the tips. Stamens adnate to the petals. Disk epigynous, red. Ovary 5-celled; style short. Fruit globose, green, glabrous or scaly, ·75″ in diameter. Seed globose, ·5″ in diameter, finely tuberculate; albumen firm.

Endemic on the Konkan and North Kanara ghâts in rain-forests. Flowers in December. Fruit ripe May.

Fig 154. Strombosia leprosa, Talb.

This tree sometimes attains a considerable size. I have measured one near Sonda (North Kanara) which was 100′ high by 3·5′ in diameter near the base and possessing a straight, cylindrical trunk.

Branches pendulous. Bark smooth, white or grey, scaly; inner-bark brown, fibrous. Wood reddish, hard, smooth and close-grained. Pores very small, single or in lines between the very fine, close medullary rays, (the diameter of the pores equalling the distance between the rays). Annual-rings distinct. Weighs 60 lbs. to the cub. ft. Distinct from *S. ceylanica,* Gardn. to which species it is united in the Fl. Br. I. on the authority of Beddome (Fl. Sylv. t. 137), who states that he has only poor specimens of the Kanara plant. Ripe fruits of *S. ceylanica,* are about half as large as those of the Kanara species which has also shining leaves. The leaves of *S ceylanica*, Gardn. are dull like those of *Lepionurus.*

5. CANSJERA, Juss.

Climbing spiny shrubs. Leaves simple, 1-nerved. Flowers bracteate in dense, axillary spikes. Perianth urceolate, 4-lobed. Fertile stamens 4, opposite the perianth-lobes; staminodes 4-5, consisting of triangular discoid glands, alternate with the stamens. Ovary 1-celled; style cylindric; stigma capitate, exserted; ovule 1, pendulous. Fruit a drupe; albumen fleshy; radicle superior; cotyledons 2-3, very long, plano-convex.

This genus is placed by many authors in the *Thymelaceæ*, as it is very doubtful whether there is a true calyx or not.

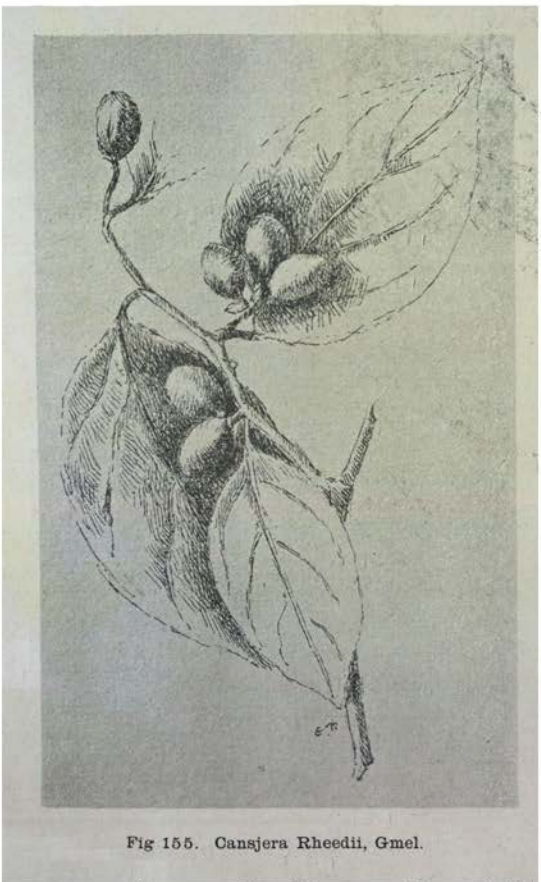


Fig 155. Cansjera Rheedii, Gmel.

C. Rheedii, Gmel. Syst. 1, 280; Fl. Br. I. 1, 582; Bedd. Fl. Sylv. Anal. Gen. t. XXVI; Brandis For. Fl. 75; Trimen Fl. of Ceylon 1, 259; Cooke Fl. Pres. Bomb. 1, 223; Brandis Ind. Trees, 149. *Bodbakka,* K. *Tarar,* M.

A climbing, evergreen shrub, sometimes spinous. Leaves 1·5″-3″ by ·75″-1·5″, glabrous, coriaceous, ovate, acuminate, yellowish and rugose when dry; lateral-nerves 3-5 pairs; petioles ·1″-·2″ long. Flowers small, yellowish, ·1″ long, pubescent, in axillary, solitary or twin spikes about ·75″ long. Bracts minute, triangular. Perianth (corolla) urceolate, 4-5-toothed, yellow, about ·1″ long. Stamens as long as tube of perianth; staminodes short, erect, acute. Ovary conical; style slightly longer than the stamens; stigma 4-lobed, just exserted. Fruit ovoid-oblong, orange-yellow or red, ·5″ long; episperm brittle, crustaceous; epicarp fleshy; embryo in the upper part of the fruit with 2 long cotyledons and a club-shaped radicle.

Upper Gangetic plain; in the forests of Oudh, Eastern and Western Peninsulas, N. Australia; on the Konkan and North Kanara ghâts, in evergreen rain and monsoon-forests. Fl. Nov.-Dec. Fruit ripe in May. Bark yellowish, corky. Wood yellow-white. Annual-rings distinct. Medullary rays fine, numerous. Pores small, scanty.

6. GOMPHANDRA, WALL.

Small trees or shrubs. Leaves alternate, simple. Flowers polygamo-dicœcious or hermaphrodite, in axillary cymes. Calyx cup-shaped, minute, 4-5-lobed. Corolla campanulate, 4-5-lobed; lobes with a prominent rib within, valvate, rarely free, often absent in the female flower. Stamens 5; filaments thick, hollowed in front to contain the anthers, tufted-hairy at the back. Male Fl.: Ovary effete, sunk in the disk; stigma minute. Fem. Fl.: Ovary cylindric, 1-celled; stigma long, discoid; ovules 2, collateral, pendulous. Disk hypogynous, thick, annular or O; funicle dilated into an obturator. Fruit a drupe; seed solitary, pendulous; stone crustaceous; albumen fleshy, bipartite; embryo minute.

G. axillaris, Wall. Cat. 3718; Fl. Br. I. 1, 586; Bedd. Fl. Sylv. 61; Cooke Fl. Pres. Bomb. 1, 224; Gamble Ind. Timb. 166; *Platea axillaris,* Dalz. & Gibs. Bomb. Fl. 28.

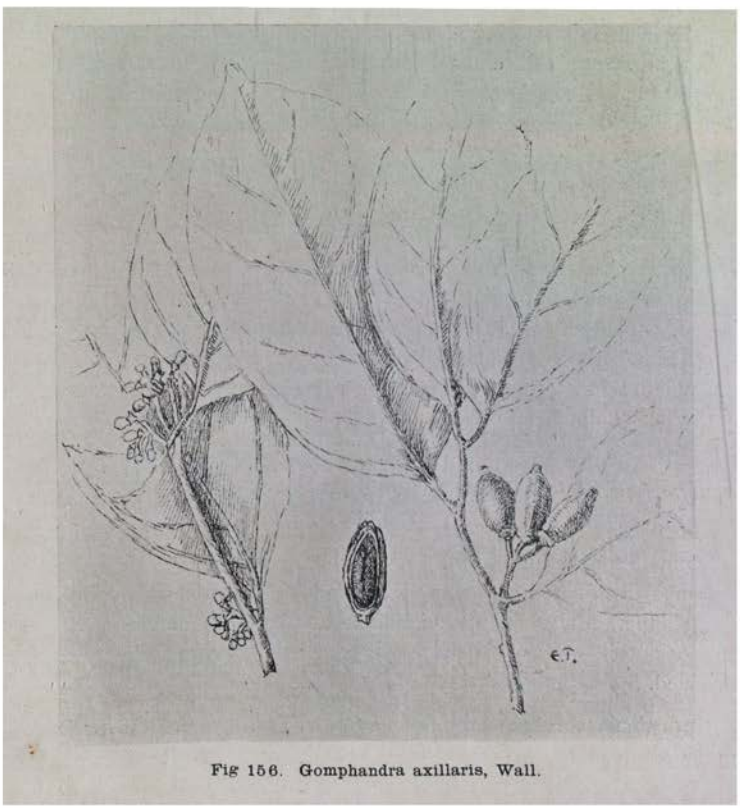


Fig 156. Gomphandra axillaris, Wall.

An erect, evergreen shrub with green branches. Leaves entire, glabrous, membranous, lanceolate or ovate, acuminate; blade 2·5″-5″ by 1″-2″; petioles ·25″-·5″ long. Flowers very small, in axillary, congested cymes. Calyx 5-toothed, tomentose on the outside. Corolla 5-divided. Petals with a long inflexed point, at length spreading. Stamens united in a column; anthers exserted, situated in cavities of the filaments which are hairy at the apex; pollen grains acutely triangular. Ovary rudimentary in the ♂. In the ♀ the ovary is small, oblong; style conic; stigma minute. Disk accrescent. Fruit ovoid, ·5″ long, white, fleshy, crowned by the remains of the stigma; stone crustaceous; albumen veined, bipartite; embryo basal, small.

Western Peninsula from the Konkan southwards to Ceylon; common in the evergreen rain-forests of the Konkan and North Kanara ghâts. Fl. April.-May. Fr. Nov.

Dr. Cooke in his Fl. Pres. Bomb. includes *G. polymorpha,* Wgt. amongst the species indigenous in Bombay and quotes Santaveri, Kanara, as a local habitat. Santaveri is however a village in the Bababuden hills at an elevation of over 4000′ near where I found this *Gomphandra* abundant. I do not think it has been found indigenous in our Bombay forests.

7. APODYTES, E. Meyer.

Trees or shrubs. Leaves simple, alternate, coriaceous or membranous, drying black. Flowers small, in terminal or axillary corymbose cymes. Calyx minute, cup-shaped, 5-toothed. Petals 5, free, valvate. Stamens 5, alternate with the petals; anthers basifixed, bilobed, sagittate. Ovary gibbous; style excentric; ovules 2, superposed. Drupe obliquely ovoid, compressed; embryo small, in the apex of the fleshy albumen.

A. Beddomei, Mast. Fl. Br. I. 1, 588; Cooke Fl. Pres. Bomb. 1, 225; *A. Benthamiana*, Var. *B.*; Bedd. Fl. Sylv. 140.

A quite glabrous tree. Leaves entire, dark-green, glossy, membranous, ovate-acuminate, narrowed into the petiole; blade 4″-6″ by 2″-2·5″; petioles 1″ long. Cymes divaricate, corymbose. Flowers ·2″ across, white, puberulous; pedicels ·1″ long. Calyx minute, cupular. Corolla-lobes obtuse at the apex, reflexed, deciduous. Ovary oblique; style excentric. Fruit obliquely ovoid, ·3″ long, wrinkled.

Western Peninsula, Nilgherry mountains and Travancore. On the Dodmune ghât of North Kanara, in rain-forests. Fl. March. Fr. R. S. A tree 50′

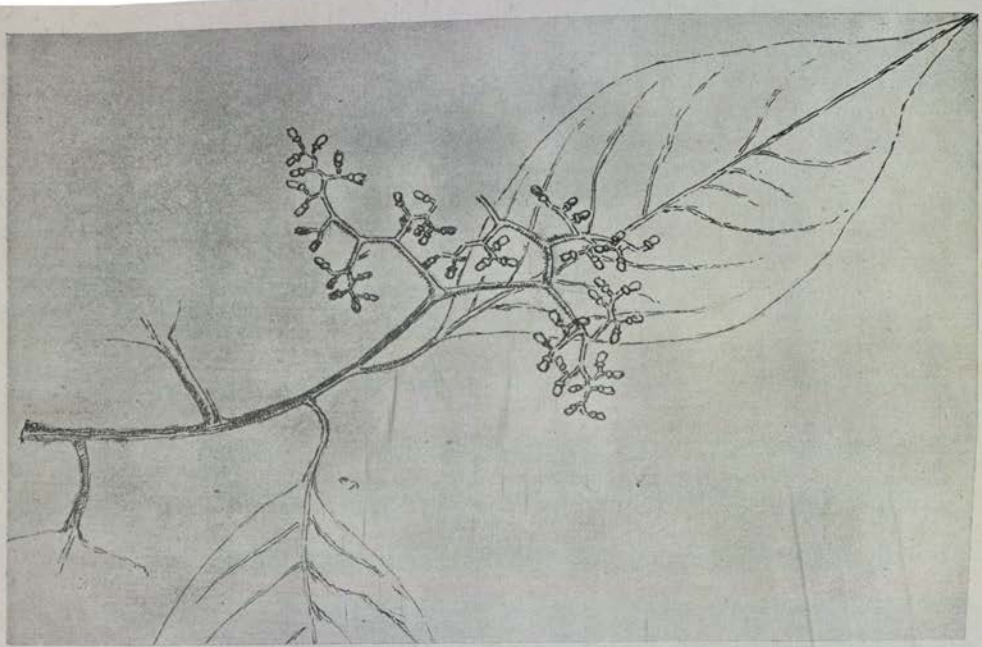


Fig 157. Apodytes Beddomei, Mast.

high by 1·5′ in diameter at the base. Bark ·5″ thick; rhytidome dark, rough, scaly with short gaping fissures in the corky layer, reddish-white beneath. Wood whitish, hard and tough. A very rare tree in the Bombay Presidency.

8. SARCOSTIGMA, W. & A.

Climbing shrubs. Leaves simple, coriaceous. Flowers dicœcious, minute, in long whip-like, interrupted spikes. Calyx cup-shaped. Petals 4-5, cohering in a short tube, free upwards, valvate. Male Fl.: Stamens 4-5, alternate with the petals and scarcely cohering with them at the base. Fem. Fl.: Staminodes 4-5. Ovary sessile, 1-celled; ovules 2, pendulous; funicle expanded into an obturator. Drupes with a woody nut; seeds pendulous; albumen O; cotyledons fleshy, wrapping round the short radicle.

S. Kleinii, W. & A. in Edin. New Phil. Jour. XIV, 299; Fl. Br. I. 1, 594; Dalz. & Gibs. Bomb. Fl. 221; Cooke Fl. Pres. Bomb. 1, 226.

A lofty climbing shrub. Leaves glabrous, coriaceous, oblong, bluntly-acuminate, pale on both surfaces; nerves prominent beneath, about 8 pairs;

blade 4″-10″ by 2″-4″; petioles ·75″ long. Flowers yellow, very small, in tufts along the whip-like rachis. Male fl.: Calyx minute. Petals glabrous, oblong, acute. Stamens as long as the petals; filaments strap-shaped. Fem. fl.: Calyx and corolla of the male. Ovary obovoid, surrounded by 5 staminodes; stigma large, subsessile, conical. Fruit compressed, orange-yellow outside, 1″-1·5″ long, size of an almond, rugose; cotyledons dark brown, fleshy with an expanded funicle; endocarp woody, lined with a white membrane.

Eastern and Western Peninsula, in the evergreen rain and monsoon-forests along the Konkan, North Kanara and Belgaum ghâts; common in the forests near the falls of Gairsoppah. Fl. Nov. Fr. ripe during May.

9. MAPPIA, JACQ.

Trees. Leaves alternate, simple. Flowers polygamous, pubescent, in terminal, corymbose cymes. Calyx 5-toothed. Petals 5, usually hairy within. Stamens 5, alternate with the petals. Disk hypogynous, cup-shaped. Ovary superior, 1-celled; ovules 2, pendulous; style short; stigma thickened. Fruit a drupe; albumen fleshy; cotyledons leafy; radicle superior.

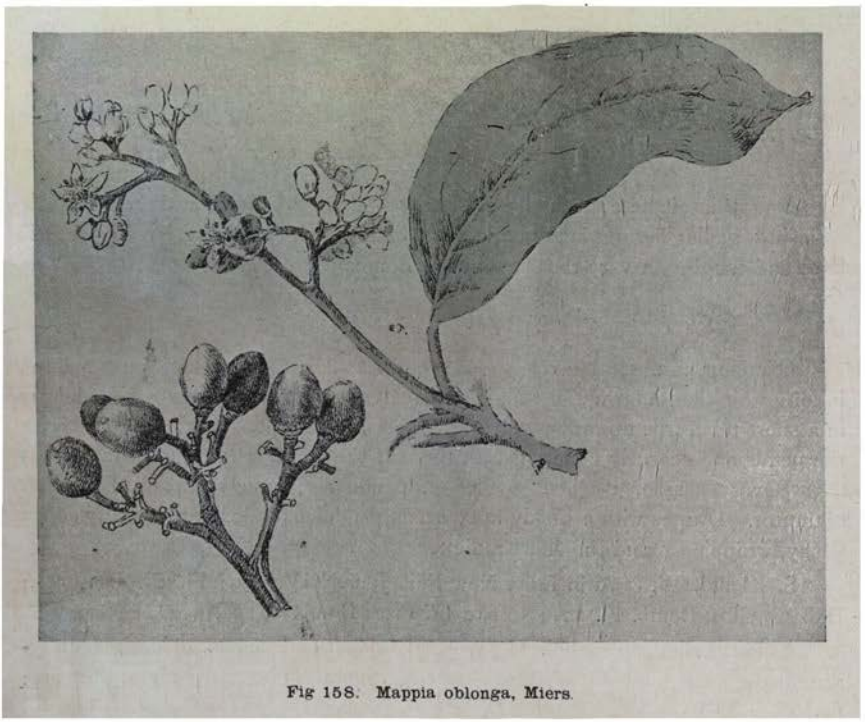


Fig 158. Mappia oblonga, Miers.

M. fœtida, Miers, Contrib. 1, 64; Fl. Br. I. 1, 589; Gamble Ind. Timb. 166; Cooke Fl. Pres. Bomb. 1, 225; *M. ovata*, Miers Contrib. 1. 65; *M. oblonga*, Miers Contrib, 1, 65; Fl. Br. I. 1, 589; Dalz. & Gibs. Bomb. Fl. 28. *Gur, kalgur, kala-gaura*, M.; *Kodsa, hedare,* K.

A large shrub or small tree 30′ high and 18″ in diameter. Leaves broad ovate, acute at both ends, sparingly pubescent on the nerves beneath, otherwise glabrous, 10″-3·5″ by 4·5″-2″; petioles 1″-2″, long. Cymes terminal, many-flowered, shorter than the leaves; pedicels very short or O. Calyx 5-fid, very short. Corolla of 5, yellow-tomentose petals, each ·2″ long. Ovary 1-celled, narrowed gradually into the style, grey-hairy. Fruit ·5″-·75″ long, ovoid, purple, 1-2-seeded; seeds albuminous; cotyledons leafy; endocarp brittle, rugose or tuberculate.

Western Peninsula from the Konkan southwards, Nilghiris 5-7000′. Anamalais, Pulneys; common on the North Kanara and Konkan ghâts, mostly in evergreen rain or monsoon-forests, one of the common trees on laterite at Mahableshwar. A large shrub, small or medium-sized tree, easily recognised when in flower by the strong fœtid smell. I have specimens of both *M. ovata*, Miers, and *M. oblonga*, Miers, but cannot find that they differ much from *M. fœtida*, Miers. Brandis considers that *M. tomentosa*, Miers, *Stemonurus fœtidus*, Wgt. Ic. t. 955, (Nilghiris) is a form of this variable species. Flowers at different times, usually during August. Fr. ripe Novr. Bark rough, grey-coloured. Wood pale-yellow, moderately-hard, close and silver-grained. Medullary rays broad with numerous intermediate fine rays, crossed by broad, continuous or interrupted bands of white, cellular tissue (same colour as the medullary rays) containing scattered, large vessels. Weighs about 40 lbs. to the cub. ft. Pith large. The wood has no distinctive odour.

Order XXIX.—ILICACEÆ.

Trees or shrubs usually evergreen. Leaves alternate, simple, exstipulate or with two minute stipules. Flowers small, in axillary cymes, fascicles or umbellules, usually dicœcious. Male with imperfect ovary and female with imperfect stamens. Calyx 3-6-lobed. Petals 4-5, connate at the base, sometimes free in the female, deciduous, imbricate in bud. Stamens as many as the petals, alternating with them, hypogynous, free or adhering to the petals. Disk O. Ovary free, 3-5-celled, with a short style or sessile stigma; ovules 1-2 in each cell, pendulous. Drupe with two or more 1-seeded, free, rarely connate stones. Seed with a membranous testa, fleshy albumen and minute embryo.

ILEX, L.

Calyx 4-5-lobed or partite. Corolla rotate; petals free or connate at the base. Stamens 4-5, adhering to the base of the corolla in the male, sometimes

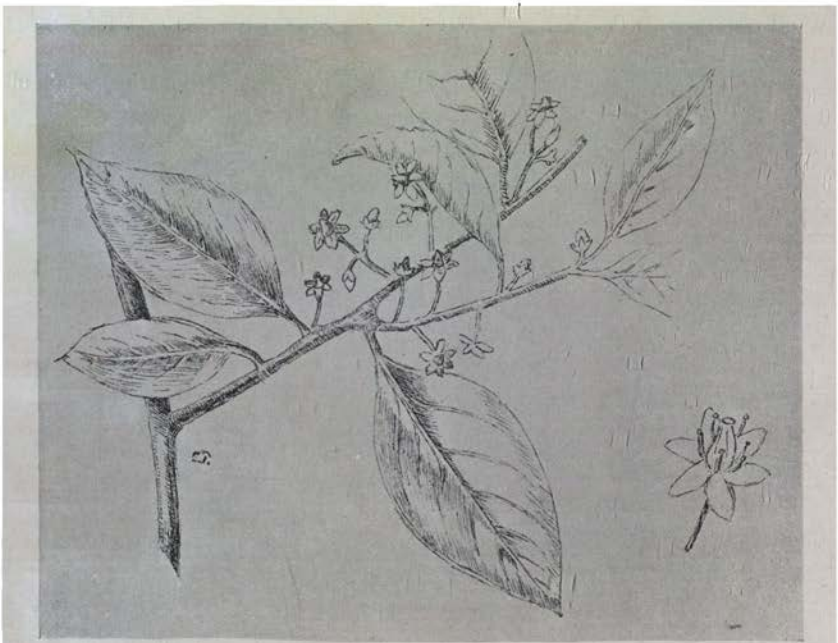


Fig 159. Ilex malabarica, Bedd.

hypogynous in the female. Ovary globose, 2-12-celled; styles O; stigmas free or confluent on the top of the ovary. Drupe globose, with 2-16 stones.

I. malabarica, Bedd. Fl. Sylv. t. 143; Fl. Br. I. 1, 600; Cooke Fl. Pres. Bomb. 1, 227; *I. Wightiana*, Dalz. & Gibs. Bomb. Fl. 143, (not of Wall).

A large glabrous tree. Leaves usually quite entire, ovate, apiculate, subcoriaceous, dark-green, shining above, paler beneath; midrib conspicuous; blade 3″-1·5″ by 1·5″-·75″; petioles ·25″-·5″ long. Flowers white, polygamous, axillary, ·1″ across, solitary, fascicled, or in short cymes, 6-merous; pedicels short. Male fl.: Calyx scarcely ciliate on the margins. Petals united at the base into a deciduous corolla, ·1″ long. Stamens 6, exserted. Rudimentary ovary 2-4-lobed at the apex. Fem. fl.: solitary or fascicled; pedicels ·25″-·3″ long. Calyx as in male. Petals nearly free at the base. Stamens as in the male, sometimes only 4. Ovary 6-celled; cells 1-ovuled; ovules pendulous; stigma 6-lobed. Drupe globose, crowned with the style, ·12″ in diameter, usually 6 or more celled, red when ripe.

Western Peninsula from the Konkan southwards. On the Belgaum and North Kanara ghâts, in rain-forest; along the banks of streams near Anmode in the Supa sub-division of North Kanara. Fl. Feb.-Apl. Fr. R. S. A large, glabrous tree. Wood hard, yellowish-white.

Order XXX—CELASTRACEÆ.

Shrubs or trees erect or climbing; branches sometimes spinescent. Leaves simple, opposite or alternate; stipules caducous or O. Flowers small, hermaphrodite or polygamous. Calyx 4-5-lobed. Petals 4-5, inserted below the disk or continuous with its margin. Stamens 3-5, alternate with the petals. Disk usually conspicuous, pulvinate or flattened, lobed or entire, rarely O. Ovary 3-5-celled, more or less immersed in the disk; ovules 2, erect, 1 pendulous, or many in each cell; style short or O; stigma triangular, rarely 3-partite. Fruit various; albumen fleshy or O; embryo usually large; cotyledons foliaceous, flat; radicle nearly always inferior.

Leaves opposite or alternate. Stamens 4-5, (rarely 10) inserted on or beneath the margin of the disk. Seed usually albuminous. (*Celastreæ*).

Leaves opposite, sometimes alternate in *Lophopetalum.*

Fruit a capsule, 1-5-celled.

Ovary-cells 1-2-ovuled; seeds not winged.

Petals free; capsule 3-5-celled ... ... 1. Euonymus.

Petals connate; capsule 1-celled ... ... 2. Microtropis.

Ovary-cells each 4-ovuled; seeds winged.

Capsule 3-celled ... ... 3. Lophopetalum.

Fruit indehiscent, coriaceous, 1-2-celled; stigma broad, peltate. A shrub ... ... 4. Pleurostylia

Fruit indehiscent, woody, 1-3-celled; stigma 2-5-lobed. A small or large tree ... ... 5. Elæodendron.

Leaves alternate.

Flowers paniculate. Ovary free.

Scandent, unarmed shrubs ... ... 6. Celastrus.

Flowers in small, axillary cymes.

Ovary confluent with the disk. Erect shrubs or small trees often spinous ... ... 7. Gymnosporia.

Leaves usually opposite. Stamens 3, rarely more or less, inserted on the face of the disk. Seed exalbuminous. (*Hippocrateæ.*)

Fruit of 3, much-flattened carpels, usually dehiscent; seeds winged ... ... 8. Hippocratea.

Fruit a berry ... ... 9. Salacia.

1. EUONYMUS, Linn.

Trees or shrubs. Leaves opposite with caducous stipules. Flowers in axillary cymes. Calyx 4-5-fid. Petals 4-5. Stamens 4-5, inserted on the disk. Disk fleshy, 4-5-lobed. Ovary immersed in the disk and confluent with it, 3-5-celled; stigma 3-5-lobed; ovules 2 in each cell. Capsule loculicidally dehiscent, 3-5-celled; cells 1-2-seeded. Seeds covered with an arillus, albuminous; embryo orthotropous; cotyledons foliaceous; radicle inferior.

E. indicus, Heyne, in Roxb. Fl. Ind. II, 409; Fl. Br. I. 1, 608; Cooke Fl. Pres. Bomb. 1, 228; *E. Goughii*, Wight; Dalz. & Gibs. Bomb. Fl. 47; Bedd. Fl. Sylv. 63.

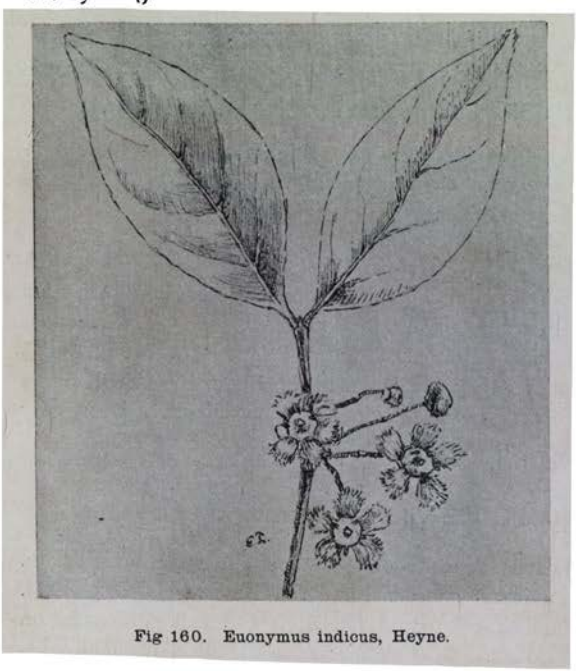


Fig 160. Euonymus indicus, Heyne.

A large evergreen shrub or small tree. Leaves opposite, thinly coriaceous, quite glabrous, elliptic-acuminate, entire or with a few serratures at the apex, dark-green above, lighter beneath; lateral-nerves 4-5 pairs, uniting within the margin; blade 5″-2″ by 2·5″-·75″; petioles ·5″ long. Peduncles 1-2, axillary, ·5″-1·25″ long, 1-3-flowered; pedicels ·25″ long. Flowers ·5″ across. Calyx 5-6 divided; lobes imbricate; margins hairy. Petals with pink, fimbriate edges, inserted on the disk. Disk large, confluent with the 5-6-celled ovary. Stamens 5 often 6, bent towards the short style in bud, afterwards bent outwards; connective broad-triangular; anthers dehiscing longitudinally. Fruit obovoid, angular or winged, ·75″ long.

Western Peninsula from the Konkan southwards; throughout the rain-forests of the Konkan and North Kanara ghàts; common on the southern ghâts of North Kanara. In flower and fruit from December till May.

A shrub or small tree. Bark ·25″ thick, smooth, lenticular; periderm bright-yellow; inner-bark reddish-white. Wood unknown.

2. MICROTROPIS, WALL.

Evergreen trees or shrubs. Leaves opposite, exstipulate. Flowers in sessile clusters or peduncled axillary or supra-axillary cymes, sometimes unisexual. Sepals 5, imbricate. Petals 5, connate at the base into a short ring. Stamens 5, inserted on the disk or on the tube of the corolla. Disk O or annular. Ovary free, 2-3-celled; style very short; stigma minutely 2-4-lobed; ovules 2 in each cell. Capsule oblong, coriaceous, 2-valved, 1-seeded. Seed erect, with a red testa; albumen fleshy; cotyledons foliaceous.

Flowers sessile, clustered on the branches ...	1.	M. latifolia.
Floweres in axillary, peduncled cymes ...	2.	M. microcarpa.

1. M. latifolia, Wight MSS.; Fl. Br. I. 1, 613.

Western Peninsula, from the Konkan to the Nilghiris; fairly common on the Bababuden Hills in the evegreen sholas at about 5000′ alt. Fl. C. S. Not observed by me in the Bombay Presidency.

2. M. microcarpa, Wight Ic. t. 975; Fl. Br. I. 1, 614.

Western Peninsula, from the Konkan and Mysore southwards. Hill forests of Southern India; common in the Nilghiris at 6000′ elevation. Not observed by me in the Bombay Presidency. Neither of these two species has been hitherto recorded from this Presidency; they are included in Floras of the Konkan on the authority of Dr. Stocks who however gives no locality. It is very doubtful whether they are indigenous in Bombay at all.

3. LOPHOPETALUM, WIGHT.

Trees and shrubs. Leaves opposite or sometimes alternate, exstipulate. Flowers somewhat large, in axillary or terminal panicled cymes. Calyx 5-lobed. Petals 5, continuous with the disk, crested or lamellate. Stamens 5, inserted on the disk. Disk large, thick, lobed. Ovary immersed in the disk, trigonal, 3-4-celled, contracted into a short style; stigma capitate; ovules 4 or more in each cell in 2 series. Capsule 3-celled, opening loculicidally in 3 valves. Seeds winged; albumen fleshy.

L. Wightianum, Arn. in Ann. Nat. Hist. III, 151; Fl. Br. I. 1, 615; Bedd. Fl. Sylv. t. 145; Dalz. & Gibs. Bomb. Fl. 48; Cooke Fl. Pres. Bomb. 1, 230; Gamble Ind. Timb. 174. *Balpale, banate,* K.

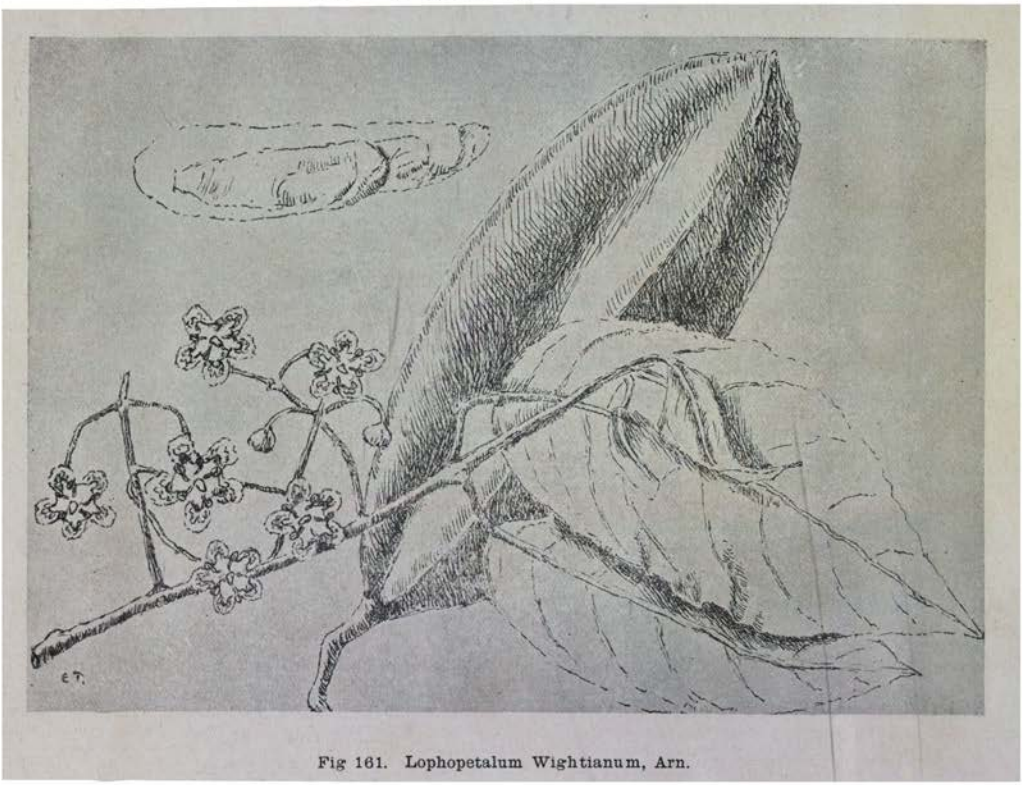


Fig 161. Lophopetalum Wightianum, Arn.

A very large evergreen tree. Leaves coriaceous, glabrous, ovate-acuminate, pale beneath; nerves about 8 pairs, distinct; blade 3″-6″ by 1·25″-2·5″; petioles 75″ long. Flowers ·5″ across, in large, axillary or terminal, branched, paniculate cymes. Calyx continuous with the disk. Disk and petals purple, the latter with a corrugated crest and yellow margins. Ovary glabrous, trigonus, sunk in the disk; style short, conical. Fruit a 3-celled, triangular capsule, tapering at both ends (sides of valve concave, equilateral in section), breaking up from the apex, 5″ by 2″, greenish-brown without, red within. Seeds thin, including the wing 3″ by ·75″; broadly winged on all sides.

Western Peninsula from the Konkan southwards, in the rain-forests of North Kanara and the Konkan ghâts, where it attains a very large size.

Fl. from Jan. till April. Fruit ripe at the beginning of the rainy season. A handsome evergreen tree with rough, scaly bark. Wood reddish-grey, light, lustrous, close-grained, moderately-hard. Pores sinuous, moderate-sized, simple or divided. Medullary rays fine and close together, traversed by continuous concentric lines of white tissue some distance apart. Weighs 28 lbs. to the cub. ft. The sinuous pores are visible in wavy lines and give the grain a curled appearance on a longitudinal section. The timber is deserving of attention for panelling and ornamental work. It is much esteemed in South Kanara for house-building purposes.

4. PLEUROSTYLIA. WIGHT.

Trees or shrubs. Leaves opposite, exstipulate. Flowers small, in short, axillary cymes. Calyx 4-lobed. Petals 5, larger than the calyx. Stamens 5, inserted below the disk; connective dilated at the back. Disk thick, crenulate. Ovary 1-2-celled, ½-immersed in the disk; stigma peltate, on a short style; ovules 2 in each cell. Fruit indehiscent, 1-2-celled. Seeds albuminous; cotyledons orbicular.

P. Wightii, W. & A. Prodr. 157; Fl. Br. I. 1, 617; Dalz. & Gibs. Bomb. Fl. 47; Bedd. Fl. Sylv. 66; Gamble Ind. Timb. 175; Cooke Fl. Pres. Bomb. 1, 230.

A small evergreen tree or large shrub. Leaves entire, glabrous, broad or narrow-lanceolate, ovate or obovate, rounded at the apex or emarginate, acutely tapering at the base, 1·5″-2·5″ by ·75″-1·25″; petioles ·15″ long. Flowers small, ·12″ across, in small axillary, paniculate cymes. Calyx glabrous, persistent; lobes short. Petals concave, rounded at tip. Stamens shorter than petals. Fruit oblong, rather attenuated at the base, about ·4″ long, white, like a miniature egg.

Ghâts of the Western Peninsula from the Konkan southwards to Ceylon, Mauritius and Madagascar; common in the subalpine forests of the Madras Presidency often near water courses. Not observed by me in North Kanara. Dalzell states in the Bo. Fl. that it is found in the Konkan, but does not give any locality. Fl. and Fr. during the cold season. Yields a very pretty moderately hard, close and even-grained light-red wood used in Cuddapah to make combs, Gamble.

5. ELÆODENDRON, JACQ. F.

Trees or shrubs. Leaves opposite, often crenate; stipules minute. Flowers small, in axillary cymes, often polygamous. Calyx 5-cleft. Petals 5, spreading. Disk thick, fleshy, angled. Stamens 5, inserted under the edge of the disk; anthers nearly globose. Ovary continuous with the disk, conical, 2-5-celled;

ovules 2 in each cell; style very short. Fruit an indehiscent drupe; cells usually 1-seeded. Seeds exarillate, albuminous.

E. glaucum, Pers. Synops. 1, 241; Fl. Br. I. 1, 623; Bedd. Fl. Sylv. 67; *E. Roxburghii*, W. & A.; Dalz. & Gibs. Bomb. Fl. 48; Brandis For. Fl. 82; Cooke Fl. Pres. Bomb. 1, 233; Gamble Ind. Timb. 178; Brandis Ind. Trees 164; *Neerija dichotoma*, Roxb. Fl. Ind. 1, 646. *Tamruj, bilur, buta-pala, aran, burkas,* M.; *Alan,* Guz.; *Mukarki*, K.

Fig 162. Elæodendron glaucum, Pers.

A small, medium-sized or very large tree. Leaves ovate, acute, crenate, thinly coriaceous; blade 2″-6″ by ·75″-2·5″; lateral-nerves about 10 pairs, looping within the margin; petioles ·5″-1″ long. Flowers small, in divaricate, dichotomously branched, axillary cymes, about as long as the leaves; peduncles longer than the petioles. Calyx-lobes broad, obtuse. Petals ·15″ long, oblong, obtuse, with membranous edges, yellowish-brown. Stamens with recurved filaments; anther-cells diverging at the base; connective broad, semicircular. Drupe ovoid or obovoid, yellowish-green when ripe; putamen very hard and bony, 1-seeded.

Outer Himalayas up to 6000′, Oudh, Central Provinces and the Peninsula; throughout the Bombay Presidency in deciduous moonsoon-forests; usually a small deciduous tree. On the ghâts of North Kanara and Belgaum in ever-

green rain and monsoon-forests, where it attains considerable dimensions, common near Goond, North Kanara. Fl. Feb.-June. Fruit ripe in May, also in Sept.-Oct. Bark usually thick, thin in large trees, grey or dark-coloured, exfoliating in small 4-sided scales. Wood reddish-brown, close-grained, compact, light, durable. Neither distinct sapwood nor annual-rings. Numerous wavy, concentric bands of light-coloured tissue. Pores small, numerous. Medullary rays fine, wavy, very numerous. Weighs 40-50 lbs. to the cub. ft. The wood is often beautifully curled and flaked, but is inclined to warp and is also liable to the attacks of borers. Used for cabinet work, picture frames, etc. Bark said to be poisonous, contains 8 % of tannin.

6. CELASTRUS, Linn.

Scandent shrubs. Leaves alternate; stipules minute or O. Flowers small, usually unisexual, in terminal or axillary panicles. Calyx 5-divided. Petals 5. Disk cup-shaped. Stamens 5, inserted on the margin of the disk. Ovary 2-4-celled; stigma generally lobed; ovules 2 in each cell. Capsule loculicidally dehiscent, 1-3-celled, 1-6-seeded. Seeds arillate; albumen fleshy; cotyledons foliaceous.

C. paniculata, Willd. Sp. Pl. 1, 1125; Fl. Br. I. 1, 617; Brandis For. Fl. 82; Dalz. & Gibs. Bomb. Fl. 47; Bedd. Fl. Sylv. 66; Gamble Ind. Timb. 175. *Black-oil, Oleum Nigrum Plant. Pigavi, kanguni,* M.; *Karigannè, kangli,* K. *Malkangni,* Bhil.

Branches rough, unarmed, covered with lenticels. Leaves alternate, petioled, ovate or obovate, acuminate, crenate, glabrous, shining above, pubescent beneath; blade 2·5″-4″ by 1·25″-2·25″; petioles ·5″ long. Flowers small, yellowish-green, unisexual, in terminal, pyramidal, panicled cymes, 2″-7″ long. Bracts small, lanceolate, deciduous. Calyx-lobes rounded, ciliate. Disk within the calyx-cup. Petals ·12″ long, spreading or reflexed. Male fl.: Stamens 5, on the margin of the disk. Rudimentary ovary slightly toothed at the apex. Female fl.: Ovary globose, glabrous; style stout; stigma large, 3-lobed. Disk larger than in the male. Staminodes with acute, non-polleniferous anthers. Capsule bright-yellow, globose; seeds 1-6, completely covered with a red, fleshy arillus.

Hilly districts of India from the Himalayas southwards to Ceylon; throughout the Presidency, often in hedges and along river and nala banks. Fl. March-Apl. when the fresh foliage also appears. Fr. June-Sept. Stems 3″ in diameter. Bark rough, grey or yellow, corky, often fibrous; young branches covered with white lenticels. Wood loose in structure, porous, pinkish-yellow, soft. Annual-rings distinctly marked by large pores in the spring-wood. Medullary rays very broad. The black oil (*oleum nigrum)* extracted from the seeds by destructive

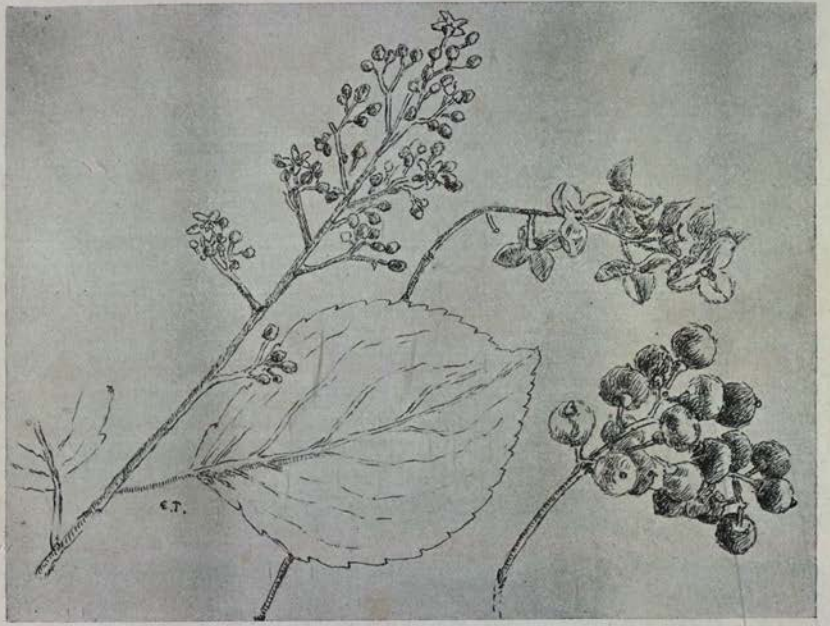


Fig 163. Celastrus paniculata, Willd.

distillation is used in native medicine in cases of gout. The orange-coloured oil also expressed from the seeds is used for burning purposes in the Belgaum Dstrict. A decoction of the wood is used in stomach disorders. Large quantities of the fruit are brought into the Belgaum city bazaar from the ghât forests during the months of July and August.

7. GYMNOSPORIA, W. & A.

Shrubs or small trees, often spinous. Leaves alternate, exstipulate. Flowers in axillary cymes. Calyx 4-5-divided. Petals 4-5, spreading. Stamens as many as petals, inserted beneath the disk. Disk sinuate, or lobed. Ovary 2-3-celled, immersed in the disk; ovules 2 in each cell. Fruit a 3-valved, 3-celled, loculicidal capsule. Seeds 1-2 in each cell, arillate, albuminous; cotyledons fleshy, broadly oval. Very closely allied to *Celastrus*, with which genus it is united by some authors.

Leaves membranous, puberulous beneath. An unarmed shrub ... ... 1. G. puberula.

Leaves coriaceous. Spinous shrubs.
Spines not leaf and flower-bearing.
Leaves glabrous. Fruit ·5″ long, obovoid, 3-celled; cells 3-seeded ... ... 2 G. Rothiana.
Spines flower and leaf-bearing.
Leaves pubescent beneath. Fruit turbinate, ·5″ long, 3-celled, and-seeded ... ... 3. G. konkanensis.
Leaves glabrous. Fruit globose, size of a small pea, 1-3-celled; cells 1-2-seeded ... ... 4. G. montana.

1. G. puberula, Laws.; Fl. Br. I. 1, 618; Cooke Fl. Pres. Bomb. 1, 232; Brandis. Ind. Trees, 164.

A small shrub; young branches, petioles and peduncles pubescent. Leaves obovate, crenate-serrate, abruptly acuminate, membranous, sparsely hairy on the nerves beneath; blade 4″-2″ by 2·5″-1″; petioles ·25″ long; lateral-nerves about 8 pairs, parallel, curved upwards. Flowers ·25″ across, in slender, dichotomous cymes which are axillary or fascicled at the ends of short branches; bracts minute, acute. Fruit obovate, obtusely angled, ·5″ in diameter, 5-celled and valved; valves coriaceous, brown outside, white shining within, reflexed when dry; pedicels about 1″ long, thickened at the top and crowned by the 5-toothed, tomentose calyx. Seeds brown, arillate at the base.

Apparently endemic in the Bombay Presidency. A rare plant found in the evergreen monsoon-forests of the Konkan and N. Kanara ghâts. Fl. R. S. Fr. C. S.

2. G. Rothiana, *(Celastrus Rothiana.)* Laws; Fl. Br. I. 1, 620; Dalz. & Gibs. Bomb. Fl. 47; W. & A. Prodr. 159; Cooke Fl. Pres. Bomb. 1, 232; Gamble Ind. Timb. 175; *G. emarginata,* Grah. Cat. Bomb. Pl. 39 *(not of Roth.). Gawlin, moti-yekkadi, bhalwan, locundie,* M.; *Dutle, chably,* K.

A large, spinescent, glabrous shrub. Leaves thick, coriaceous, obovate, acuminate, cuneate at the base, minutely crenate-serrate, dark-green, shining above, lighter-coloured beneath; blade 3″-6″ by 1·5″-3·5″; petioles ·5″ long. Flowers polygamous. Male fl. ·3″, across, in short, axillary, clustered cymes. Calyx 5-lobed; lobes obtuse. Petals 5, triangular, spreading. Disk 10-lobed, red. Stamens 5, inserted underneath the disk and alternate with the petals; pedicels ·2″ long. Hermaph. fl. white, slightly smaller than the male. Disk not conspicuous. Ovary 3-celled, immersed in the disk; stigmas 3, reflexed and slightly flattened at the ends. Capsule woody, obovoid, bright-red when ripe, 3-celled; cells 2-seeded; seeds brown, smooth, shining, with a small, white, basal arillus.

Fig 164. Gymnosporia Rothiana, W. & A.

Western Peninsula, Konkan, Deccan and North Kanara in evergreen monsoon and rain-forests from the sea-level upwards to 4000′. Fl. March-Apl. and at other times throughout the year. Fr. at different times. A large spinous shrub, with long, straight thorns. Wood reddish-grey, smooth, moderately hard. Pores small, in radial lines between the fine and very fine medullary rays. Annual-rings distinct. Weighs about 42 lbs. to the cub. ft.

3. G. konkanensis, sp. nov. *Pitori.* M.

A stout rambling shrub with puberulous, sometimes flattened branchlets and spines bearing leaves and flowers. Leaves ovate or obovate, crenate-serrate, acute or acuminate, narrowed into the petiole at the base, coriaceous, pale, pubescent beneath, hispidulous with scattered short white hairs above; blade 2·75″-1·5″ by 1·5″-·75″; lateral-nerves about 6 pairs strongly curved upwards; petioles ·25″ long. Flowers small, white, ·25″ across, in very slender, branched cymose panicles about 2″ long, axillary or fascicled, often on long or short spines;

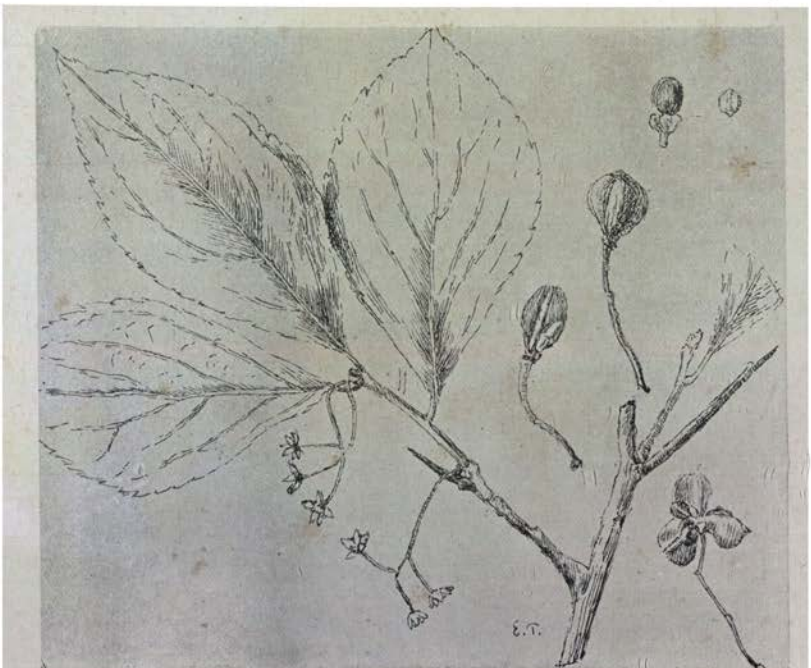


Fig 165. Gymnosporia konkanensis, Talb.

bracts and bracteoles small, acute, spreading. Calyx minute, consisting of 5, rounded sepals. Petals veined, ovate, obtuse, 3-times as long as the sepals. Stamens inserted under the disk. Ovary globose, surrounded by a thick, lobed disk at the base, but scarcely confluent with it, narrowed into a short, thick style with a capitate, lobed stigma, 3-celled; cells 1-ovuled. Capsule green, turbinate, pointed at apex, ·5″ long, more or less acutely trigonous, 3-celled; cells 1-seeded; seeds oblong, ·2″ long with a white, lobed basal arillus situated beneath and free from

the seed. Episperm white, smooth, thick, and fleshy.

Found in the Bassein sub-division of Thana; common in the Paral forests; was collected in flower and fruit during July and appears distinct from the other indigenous *Gymnosporias* found in the Bombay Presidency. Closely allied to *G. puberula,* Laws. but differs in its robust, spinous habit, consistence of leaves, size of fruit etc., from that species.

An erect or rambling thorny shrub with stems 2″ thick. Bark grey, smooth, thin, corky on the surface, reddish within. Wood reddish-white, hard, close-grained, smooth, heavy, with numerous concentric bands of light-coloured tissue. Pores very small and indistinct. Medullary rays numerous, very fine.

4. G. montana, {Roxb. Fl. Ind. 1, 620 *(Celastrus)*} Fl. Br. I. 1, 621; Cooke Fl. Pres. Bomb. 1, 233; *Celastrus montana,* W. & A. Prodr. 159; Bedd. Fl. Sylv. 66; Dalz. & Gibs. Bomb. Fl. 48; *C. senegalensis,* Lam.; Brandis. For. Fl. 81; Gamble Ind. Timb. 177. *Hurmacha,* Vern. *Mal-kanguni,* K.; *Tondarsai-jhad,* H.; *Yekkadi, bharatti,* M.

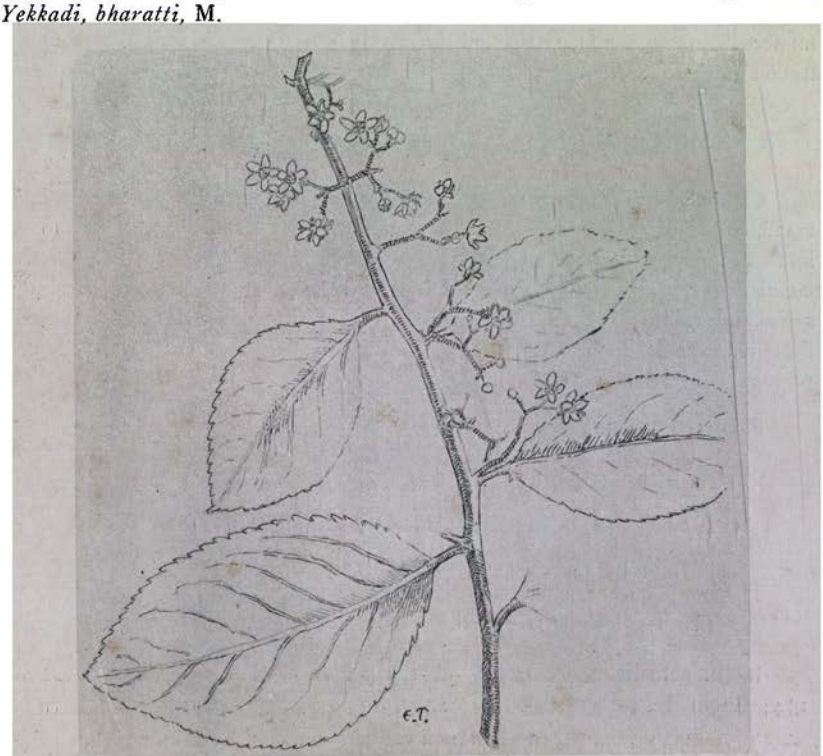


Fig 166. Gymnosporia montana, Roxb.

A large glabrous shrub or small tree; spines 1″-2″ long. Leaves pale-green or glaucous, obovate, oblanceolate or linear-spathulate, crenate, thick coriaceous; blade 1″-3″ by ·25″-2″; petioles 0·5″ long. Cymes shorter than the leaves, on short, axillary, tubercular branches or on the spines. Flowers small, white; a large proportion sterile. Calyx-lobes fimbriate. Petals oblong. Disk 10-lobed. Style short; stigma 3-lobed. Capsule globose, size of a small pea, 1-3-celled; cells 1-2-seeded. Seeds brown, arillate; arillus white, fleshy, covering the whole of the seed; albumen white; cotyledons green, fleshy.

Widely distributed from the Mediterranean region to tropical Africa and India; common throughout the Deccan districts in open dry forests and in the drier parts of North Kanara, Guzerat and Sind. Flowers at various times throughout the year. Attains a height of 15′-20′. Bark moderately thick; outer-bark grey, scaly; inner bright-red with distinct broad or narrow irregular longitudinal veins of white tissue. Wood reddish-white, durable. Pores small, very numerous between the many medullary rays. No distinct annual-rings, but there are numerous, narrow, concentric, indistinct rings of white tissue. Weighs about 45 lbs. to the cub. ft.

8. HIPPOCRATEA, Linn.

Climbing shrubs or small trees. Leaves opposite, entire or serrate; stipules small, caducous. Flowers cymose, bisexual. Calyx 5-divided. Petals 5, spreading. Stamens 3, recurved, lying in the grooves of the ovary. Disk conical or cupular. Ovary 3-celled, surrounded by the disk; ovules 2-10 in each cell, in 2 series, inserted on the inner angle; style very short; stigmas 1-3. Fruit of 3, flattened carpels, distinct, septicidally 2-valved; valves boat-shaped. Seeds compressed, winged below, exalbuminous.

Flowers small, ·25″ across, in large cymes.
- Calyx-lobes entire. Petals thick, triangular, from a broad base. Carpels 1·5″ long ... ... 1. H. obtusifolia.
- Calyx-lobes pectinate. Petals linear, ovate, cucculate, membranous. Carpels 4″ long... ... 2. H. Grahami.

Flowers minute, in short, much divided cymes. Carpels 1·5″ long ... ... 3. H. indica.

1. H. obtusifolia, Roxb. Fl. Ind. 1, 166; Fl. Br. I. 1, 623; W. & A. Prodr. 104; Wight. Ic. t. 963; Cooke Fl. Pres. Bomb. 1, 234. / *Daushir,* M.

A climbing shrub with twining branches. Leaves shortly petioled, very coriaceous, glabrous, elliptic, obtuse or acute, entire or faintly crenate; blade

2″-5″ by 1″-3″; petioles ·25″ long. Flowers in axillary or terminal, puberulous, panicled cymes, often longer than the leaves; buds conical; pedicels puberulous. Calyx-lobes entire. Petals 4-5, ·1″ by ·05″, triangular, from a broad base, slightly imbricate in bud, puberulous outside and much longer than the calyx. Disk puberulous larger than in the next species. Carpels obovate, emarginate, striate, 1·5″-2″ long. 4-6-seeded.

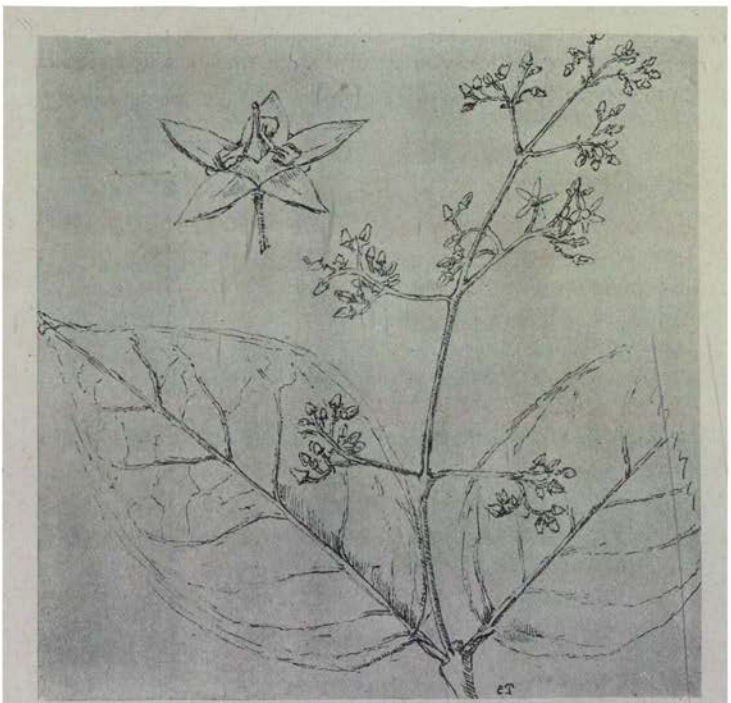


Fig 167. Hippocratea obtusifolia, Roxb.

Eastern and Western Peninsulas, from Tenasserim and the Konkan southwards. In the moist monsoon-forests of the Konkan and North Kanara ghàts. Fl. C. S. Fruit ripe Apl.-May.

Bark grey, corky; inner-bark yellowish. Wood in radial wedges separated by soft tissue in deep bays from the outside, moderately hard. Pores moderate-sized. Medullary rays broad. Gamble.

2. **H. Grahami,** Wight Ic. t. 380; Fl. Br. I. 1, 624; Dalz. & Gibs. Bomb. Fl. 32; Wight Ic. t, 380; Cooke Fl. Pres. Bomb. 1, 235. *Yesti,* M.

A climbing shrub. Leaves broadly ovate or obovate, glabrous, coriaceous, abruptly acuminate, sharply crenate; lateral-nerves 4 pairs; blade 4″-3″ by 2·5″-2″; petioles ·5″-·75″ long. Flowers glabrous in axillary, panicled cymes, longer than the leaves; buds globose. Calyx-lobes with pectinate or ciliate margins. Petals ·12″ by ·05″, narrow, cucculate, very shortly clawed, membranous. Disk smaller than in *H. obtusifolia,* puberulous. Style short, columnar. Carpels 3·5″ by 1″, emarginate and often oblique at the apex, striate, 4-seeded; wings of seeds brown. The enlarged figure of the flower of this species in plate 380 of Wight's Icones represents the calyx-lobes entire ciliate and the petals flat which is not the case in the North Kanara plant.

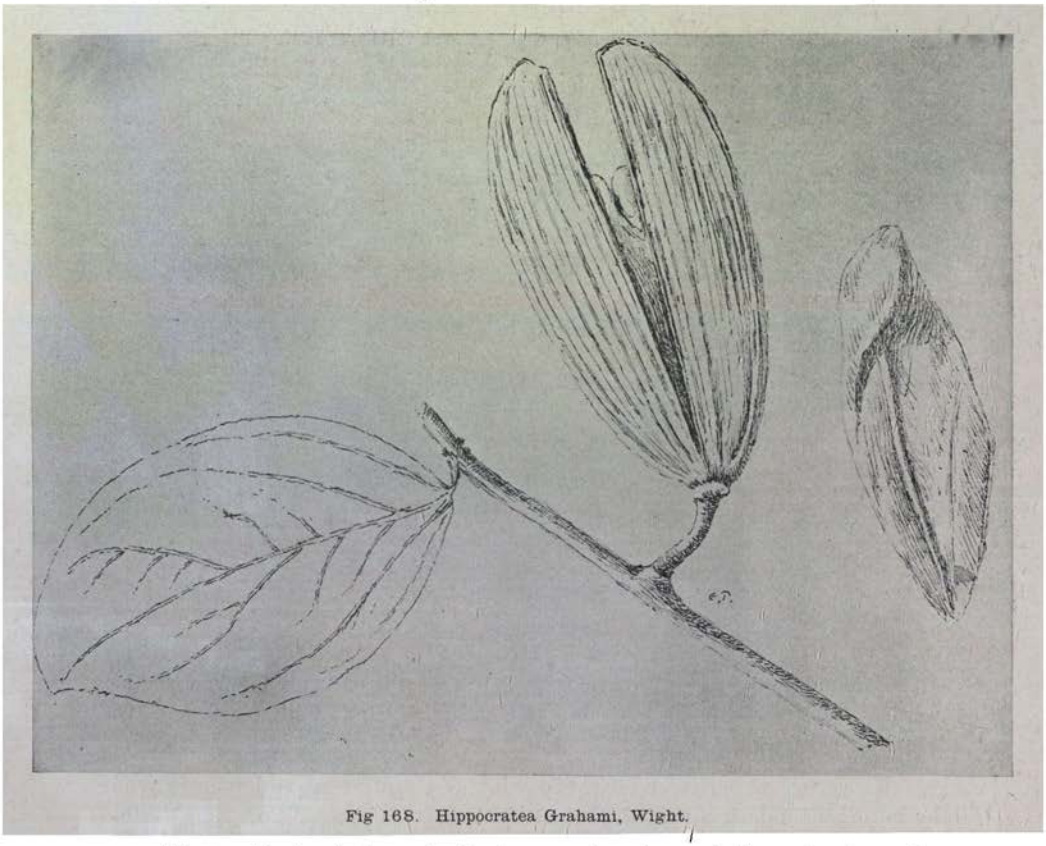


Fig 168. Hippocratea Grahami, Wight.

Western Peninsula from the Konkan southwards; probably endemic on the ghàts of the Konkan and North Kanara in rain-forest. Fl. H. S. Fruit ripe Nov.-Dec.

3. H. indica, Willd. Sp. Pl. 1, 193; Fl. Br. I. 1, 624; Dalz. and Gibs. 32; Brandis For. Fl. 83; Cooke Fl. Pres. Bomb. 1, 235. *Kazurati, turruli,* Vern.; *kanguna-bally,* K.

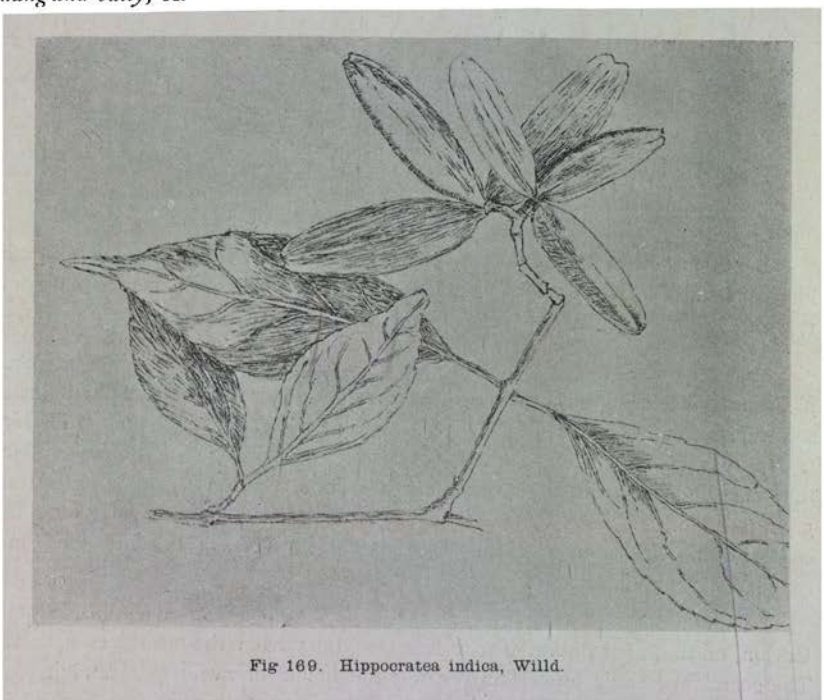


Fig 169. Hippocratea indica, Willd.

A climbing shrub. Leaves membranous or thin, ovate, acute or bluntly acuminate, acute at the base, finely serrate, glabrous, light-green; blade 2″-3″ by 1″-1·5″; petioles ·25″ long. Flowers yellow, very minute, in slender, axillary panicles, shorter than the leaves; ultimate branches subumbellate; buds globose. Calyx-lobes ovate, entire. Petals elliptic, concave. Carpels 1·5″ by ·5″, obtuse, striate, 2-4-seeded.

Southern India, Bengal, Behar, Burma, Ceylon and the Indian Archipelago; throughout the moist evergreen monsoon-forests of the Konkan and North Kanara. Fl. C. S. Fr. Apl.-June. Stems very slender.

9. SALACIA, Linn.

Climbing or straggling shrubs. Leaves opposite, exstipulate. Flowers small, usually fascicled in the axils of the leaves; rarely terminal. Calyx small, 5-divided. Petals 5, imbricate. Disk thick, sinuate. Stamens 3, rarely 2 or 4,

continuous with the disk, recurved. Ovary conical, immersed in the disk, 3-celled and-angled, ovules 2 or more in each cell; style very short; stigma simple or 3-lobed. Fruit a berry. Seeds large, angular; cotyledons thick; radicle short, inferior.

Flowers 3-6-fascicled from an axillary tubercle ...	1.	S. prinoides.
Flowers numerous, fascicled from an axillary tubercle	2.	S. macrosperma.
Flowers usually in threes on a common peduncle, sometimes in short, axillary cymes.	3.	S. oblonga.

1. S. prinoides, DC. Prodr. 1, 571; Fl. Br. I. 1, 626; Dalz. & Gibs. Bomb. Fl. 33; Bedd. Fl. Sylv. 67; Cooke Fl. Pres. Bomb. 1, 236; Trimen Fl. Ceylon 1, 276. *Nisul-bondi,* M.

An erect, straggling or climbing shrub or small tree; branchlets angular, glabrous. Leaves opposite, oblong or ovate, coriaceous, obtusely-acuminate, serrate, glabrous; blade 1·5″-3″ by ·75″-1·25″; petioles about ·25″ long. Flowers ·25″ across, yellow, honey-scented, fascicled, about 6 together on an axillary tubercle; pedicels about ·5″ long. Calyx-divisions 5, puberulous outside. Petals 5, unguiculate, ·12″ long. Stamens 3, reflexed when the flower is open over the conical disk. Fruit globose, size of a small cherry, black or red; seed surrounded with an edible, white, glutinous pulp.

Silhet and the Khasia mountains, Eastern and Western Peninsulas and Ceylon, on the Konkan and North Kanara ghâts from the sea-level upwards. The scandent form is often found along the banks of rivers (Kalanuddi, etc). The erect shrubby form is abundant in the evergreen forests of the southern ghâts of North Kanara. Fl. & Fr. at different times throughout the year.

2. S. macrosperma, Wight Ic. t. 962; Var. *angustifolia;* Fl. Br. I. 1, 628; Bedd. Fl. Sylv. 67; Cooke Fl. Pres. Bomb. 1, 237. *Lendphal,* M.

A stout, scandent shrub. Leaves ovate, or oblong-elliptic, bluntly-acuminate, faintly distantly serrate coriaceous, glabrous, shining above, paler beneath; blade 3·5″-5″ by 1·5″-2·25″; petioles ·25″ long. Flowers small, numerous, pedicelled, densely fascicled on axillary tubercles; pedicels slender, about 3″ long. Calyx-lobes obtuse, fringed with yellow hairs. Petals ·12″ long, ovate, with thin margins, entire. Disk convex, depressed in the centre. Stamens with broad, short filaments. Ovules 2 in each of the 3 ovarian cells. Fruit globose or irregularly globose, orange-coloured, about 1·2″ in diameter, subtended by the calyx. Seeds 4, ovoid, flattened, ·5″ long, immersed in a pleasantly scented and tasted pulp; outside mottled; hard and brown within.

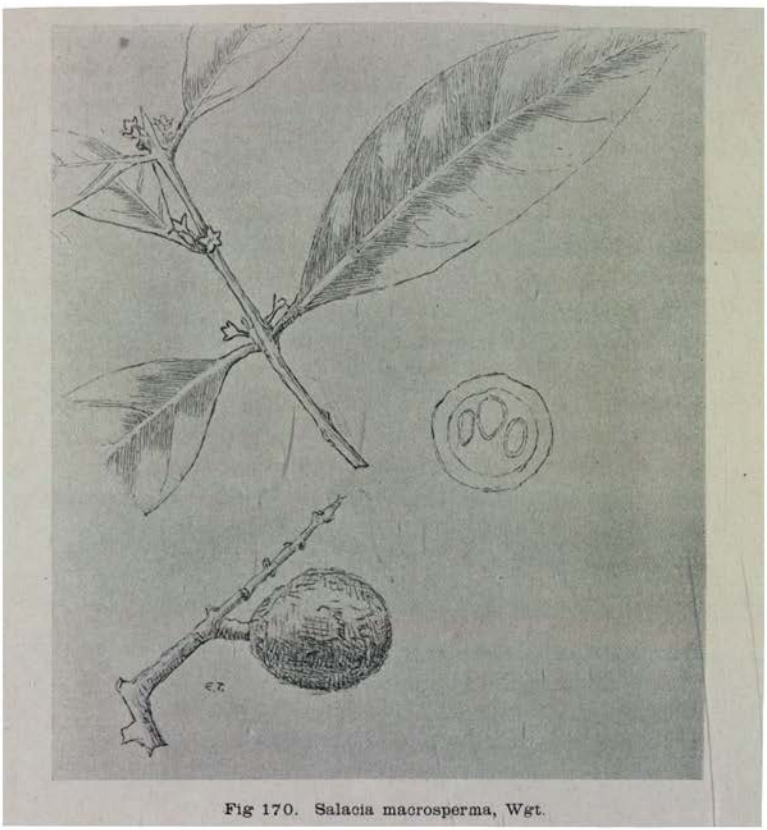


Fig 170. Salacia macrosperma, Wgt.

Western Peninsula from the Konkan southwards; common in the forests near the Ainshi Ghát of North Kanara. Fl. C. S. Fr. June. Fruit edible.

3. S. oblonga, Wall. Cat. 4226; Fl. Br. I. 1, 628; Dalz. & Gibs. Bomb. Fl. 23; Bedd. Fl. Sylv. 67; Cooke Fl. Pres. Bomb. 1, 237.

A climbing, scandent shrub. Leaves ovate, or ovate-lanceolate, emarginate or entire, acute or shortly obtusely-acuminate, entire or slightly distantly serrate, thinly coriaceous, glabrous, yellow when dry; blade 3″-6″ by 1·25″-2″; petioles ·75″ long. Flowers yellow, ·35″ across, in short congested, supra-axillary cymes. Calyx-lobes rounded, glabrous, entire. Petals broad, ·3″ long, imbricate, recurved at the tips in the open flower. Stamens 3; anthers 2-lobed. Ovary conical, ½-immersed in the disk; style short. Fruit globular, about 2″ in diameter, 4-seeded, light-brown coloured outside when ripe; seeds are covered with much

scaly tissue; seeds 1-8, ·75″ long by ·5″ broad, irregularly-ovoid, flattened; cotyledons hard, brown.

Western Peninsula from the Konkan southwards, Ceylon; common in some of the North Kanara ghát rain-forests. Fl. C. S. Fr. ripe during the rains.

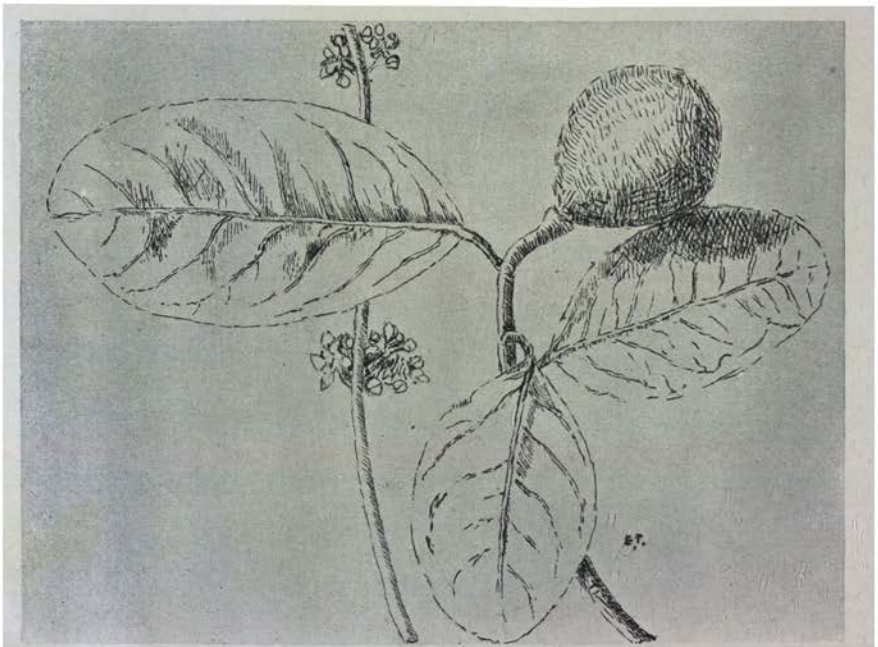


Fig 171. Salacia oblonga, Wall.

S. Roxburghii, Wall., is a doubtful native of the Western Peninsula. Dalzell and Gibson's plant referred to in the Bomb. Fl. 33 is probably *S. macrosperma,* Wgt. *S. Brunoniana,* W. & A. was included in my Trees, Shrubs and Woody climbers of the Bombay Presidency, (1902) on the authority of Dalz. and Gibs. who state on p. 33 of the Bomb. Fl. that it is found on the Ram Ghát in the Southern Mahratta Country. There is no specimen in Dalzell's herbarium from that locality and as the plant does not appear to have been seen by any subsequent collector I have excluded it from the present work.

Order XXXI.—RHAMNACEÆ.

Shrubs or trees, erect or scandent, prickly, spinous or unarmed. Leaves simple, alternate or sometimes opposite, usually coriaceous, often 3-5-nerved; stipules small or changed into prickles. Flowers small, greenish, hermaphrodite or polygamous, in axillary cymes, spikate, paniculate, fascicled or solitary. Calyx 4-5-cleft; lobes triangular, valvate in bud. Petals 4-5, rarely O, inserted on the throat of the calyx-tube, cucullate or involute. Stamens 4-5, opposite the petals, often enclosed by them; anthers versatile, longitudinally dehiscent. Disk fleshy, filling the calyx-tube or thin and lining it. Ovary sessile, free or immersed in the disk, more or less adherent to the calyx-tube, 2-3-celled; cells 1, rarely 2-ovuled. Fruit various, superior or inferior, usually 3-celled, capsular and sometimes winged or drupaceous. Seed generally albuminous; embryo large, erect; cotyledons flat and fleshy.

Fruit dry, indehiscent 1-celled, 1-winged .. ... 1. Ventilago.

Fruit a dry or fleshy drupe with a 1-3-celled stone, not-winged ... ... 2. Zizyphus.

Fruit dry, indehiscent, 2-4-celled and seeded or a fleshy berry of 3 distinct pyrenes or cocci.

Disk lining the calyx-tube or fleshy and filling it.

Disk thin, lining the calyx-tube ... ... 3. Rhamnus.

Disk fleshy, filling the calyx-tube.

Flowers pedicelled, in axillary fascicles or sub-umbellate. ... ... 4. Scutia.

Flowers sessile, in terminal panicles. ... 5. Sageretia.

Fruit capsular.

Ovary ½-inferior. Fruit tardily dehiscent. ... 6. Colubrina.

Ovary inferior. Fruit 3-winged, crowned with the calyx-limb ... ... 7. Gouania.

1. VENTILAGO, GÆRTN.

Scandent shrubs. Leaves subdistichous, alternate; stipules very minute, caducous. Flowers small, in axillary and terminal panicles. Calyx 5-cleft; lobes keeled within. Petals 5, hooded, deflexed. Stamens 5, adnate to the base of the petals. Disk 5-lobed, filling the calyx-tube. Ovary sub-globose,

immersed in the disk, 2-celled; style very short. Fruit 1-celled, 1-seeded, produced at the summit into a linear, oblong, coriaceous wing and girt at the base or round the middle by the persistent calyx. Seed sub-globose, exalbuminous.

Flowers in terminal, simple or panicled spikes.
Nut girt at the base. Ovary with a few white hairs at the base. Calyx glabrous within ... ... 1. V. madraspatana.
Nut girt round the middle. Ovary densely pubescent. Calyx also densely pubescent within ... 2. V. calyculata.
Flowers in axillary fascicles ... ... 3. V. bombaiensis.

1. V. madraspatana, Gærtn. Fruct. 1223. t. 49. f. 2; Fl. Br. I. 1, 631; Dalz. & Gibs. Bomb. Fl. 48; Brandis For. Fl. 96; Cooke Fl. Pres. Bomb. 1, 238; Gamble Ind. Timb. 180. *Locundie, kanwail,* M.; *Sakal-yel,* M.

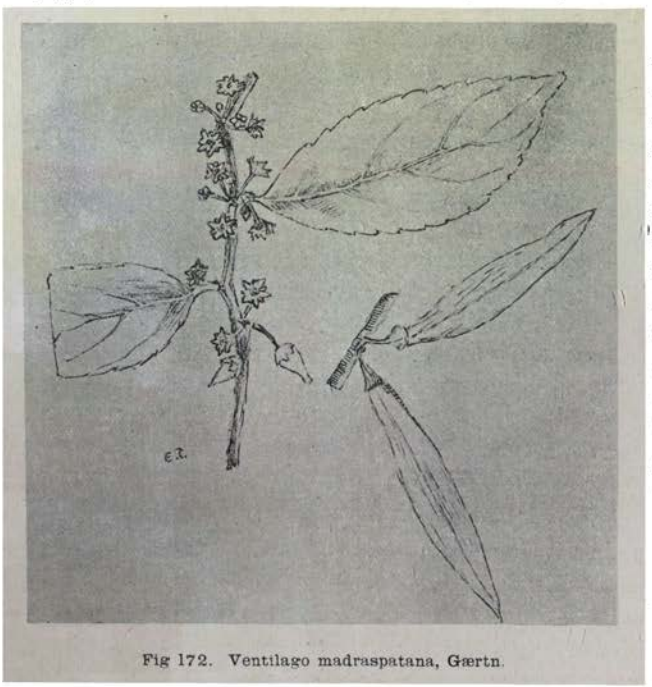


Fig 172. Ventilago madraspatana, Gærtn.

A large, woody climber. Leaves ovate to oblong-lanceolate, acute or acuminate, crenate or entire, glabrous, shining above, paler beneath; blade 2″-3″ by 1″-·75″; lateral-nerves 6 pairs, distinct; stipules small, subulate; petioles ·25″-·5″ long. Flowers greenish-yellow, about ·12″ in diameter, scented, fascicled along large leafy panicled-spikes. Calyx pubescent or puberulous outside, glabrous within; lobes keeled inside with a hard, incurved point at the apex. Petals smaller than the calyx-lobes and shorter than the enveloped stamens. Disk pubescent. Ovary with a few white hairs at the base; styles nearly straight. Nut ·2″ in diameter girt at the base and seated on a flat disk formed by

the remains of the calyx; wing yellowish, longitudinally veined, leathery, puberulous, 2″-3″ by ·25″-·5″, obtuse or apiculate, sometimes bifid at the apex.

Fig 173. Ventilago madraspatana, Gærtn.—*Fruit.*

Western Peninsula from the Konkan southwards, Tenasserim, Ceylon in the low dry country very common, rather rare in the moist region, Java; throughout the moist monsoon-forests of the Konkan and North Kanara. Fl. Dec.-Jan. Fr. March-May A large climber; stems 4″ in diameter, spirally covered with knobs which develop fine roots at the base of the stem. Bark smooth, thin, dark-grey, vertically shallow-fissured. Wood greyish-yellow, porous, soft. A valuable red dye is obtained from the root which is an important minor forest produce in the Deccan, Carnatic and the Nilghiris. Cordage is also made

from the bark.—Gamble. In Ceylon the bark is used for tanning and is exported for that purpose on a small scale from Trincomalee.

2. V. calyculata, Tulasne in Ann. Sc. Nat. Ser. 4. VIII, 124; Fl. Br. I. 1, 631; Brandis For. Fl. 96; Cooke Fl. Pres. Bomb. 1, 239. *Papri*, Vern. *Kuriyadi, gapsandi-bally*, K.

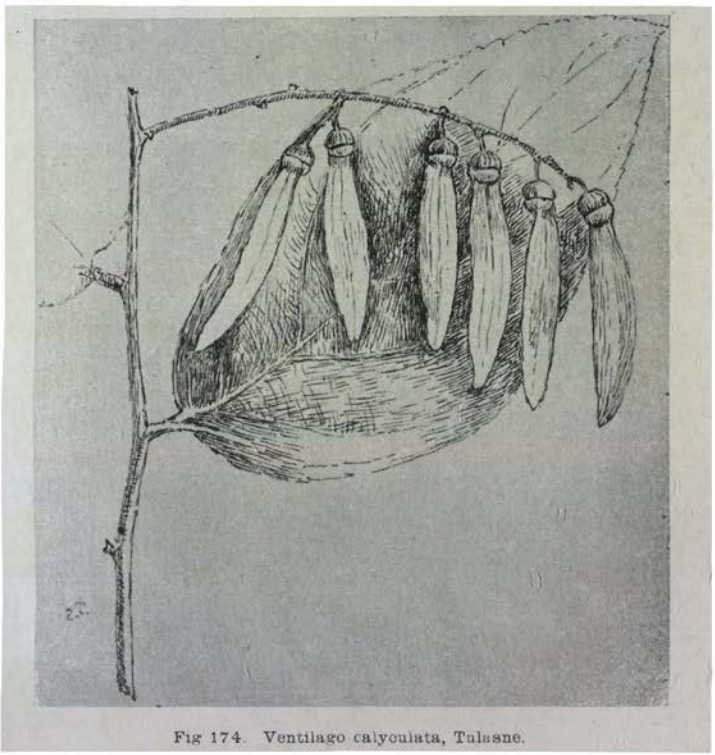


Fig 174. Ventilago calyculata, Tulasne.

A large scandent, climbing shrub. Leaves elliptic-oblong, irregularly dentate or entire, coriaceous, pubescent when young, ultimately glabrous; lateral-nerves 6 pairs, strong beneath, joined by numerous fine parallel veins; blade 3·5″-6″ by ·5″-2·5″; petioles ·25″-·5″ long. Flowers strongly scented, greenish, tomentose, clustered, forming tawny-coloured, leafless, terminal, large panicles. Ovary densely pubescent; styles diverging. Nut size of a pea, girt about the middle by the remains of the calyx; wing yellow, pubescent, veined, 2·5″ by ·4″, often bifid at the apex.

Throughout the hotter parts of India from Nepal to Tenasserim, Western Peninsula; very common in the deciduous, monsoon-forests of the Konkan and

Deccan; is found also in the rain-forests of North Kanara. Flowers during the rainy season. Fruit ripe February in North Kanara. Stems 6″ to 1′ in diameter; branchlets green, angled and fluted. Bark sometimes nearly smooth, in old stems rough at the base, very characteristic, the fissures showing a vermillion-coloured tissue, more or less developed; inner-bark yellowish-brown, said to yield a good cordage. An oil is obtained from the seeds. Wood yellowish, fibrous and moderately-hard. Pores large, oval, simple or divided, very numerous between the moderately-broad medullary rays. Annual-rings not distinct.

3. V. bombaiensis, Dalz. in Hook. Kew Jour. Bot. 3, 36; Fl. Br. I. 1, 631; Dalz. & Gibs. Bomb. Fl. 48, Cooke Fl. Pres. Bomb. 239.

A climber with zig-zag, rufous-tomentose branchlets. Leaves ovate or elliptic-lanceolate, acute, sharply crenate-serrate, glabrous, pale, beneath; lateral-nerves 4-5 pairs with rufous hairy, glandular axils. Flowers small, yellowish, ·1″ across, 10-20 together, in axillary fascicles. Calyx red-pubescent outside; lobes triangular with a broad irregular keel in the middle of the upper half within. Disk filling the calyx-tube. Stamens enclosed in the truncate petals; anthers with 4 distinct equal lobes. Ovary immersed in the disk, rufous-hairy at tip, 2-celled; cells each with 1-ovule; styles like 2 minute diverging horns. Fruit not seen. It should be looked for on the Devimone ghát of North Kanara.

A large climbing shrub endemic in the rain-forests of the Belgaum and North Kanara Ghâts. Fl. C. S. A distinct species.

2. ZIZYPHUS, Juss.

Trees or shrubs, sometimes climbing, usually armed with stipular sharp prickles. Leaves alternate, often oblique at the base, palmately 3-5-nerved. Flowers fascicled or in axillary sessile or peduncled cymes. Calyx 5-fid; lobes keeled within; tube broadly obconic. Petals 5, hooded. Disk flat, filling the short calyx-tube. Ovary immersed in the disk, 2-4-celled; styles 2-4, free or more or less united, divergent. Fruit fleshy or dry, containing a woody or bony, 1-4-seeded stone. Seeds plano-convex; albumen O or very scanty; cotyledons thick; radicle short.

Flowers in sessile or peduncled cymes or fascicled in the axils of the leaves. Ovary 2-celled. Usually prickly trees or shrubs.

A tree. Fruit globose, more than ·5″ in diameter, brown, orange or red when ripe ... ... 1. Z. jujuba.

A small, unarmed tree. Fruit globose ·35″ in diameter, yellow ... ... 2. Z. trinervia.

A straggling or bushy shrub. Fruit globose ·3″ in diameter, red, shining when ripe ... 3. Z. nummularia.

A climbing, scandent shrub. Fruit globose, ·25″ in diameter, yellow, turning black when quite ripe ... ... 4. Z. Œnoplia.

Flowers in pedunculate, axillary cymes. Ovary 3-celled.

A small tree or straggling shrub. Fruit globose, 1″ in diameter, green, glabrous when ripe, very hard, woody ... ... 5. Z. xylopyra.

Flowers in peduncled, cymose, terminal panicles. Ovary 2-celled.

A straggling shrub. Fruit ·3″ in diameter, white, mealy when ripe; stone crustaceous ... 6. Z. rugosa.

1. Z. Jujuba, Lamk. Dict. III, 318; Fl Br. I. 1, 632; Dalz. & Gibs. Bomb. Fl. 49, Bedd. Fl. Sylv. t. 149; Brandis For. Fl. 86; Cooke Fl. Pres. Bomb. 1, 240; Gamble Ind. Timb. 181. *Ilanji,* K.; *Bor, ber,* M.

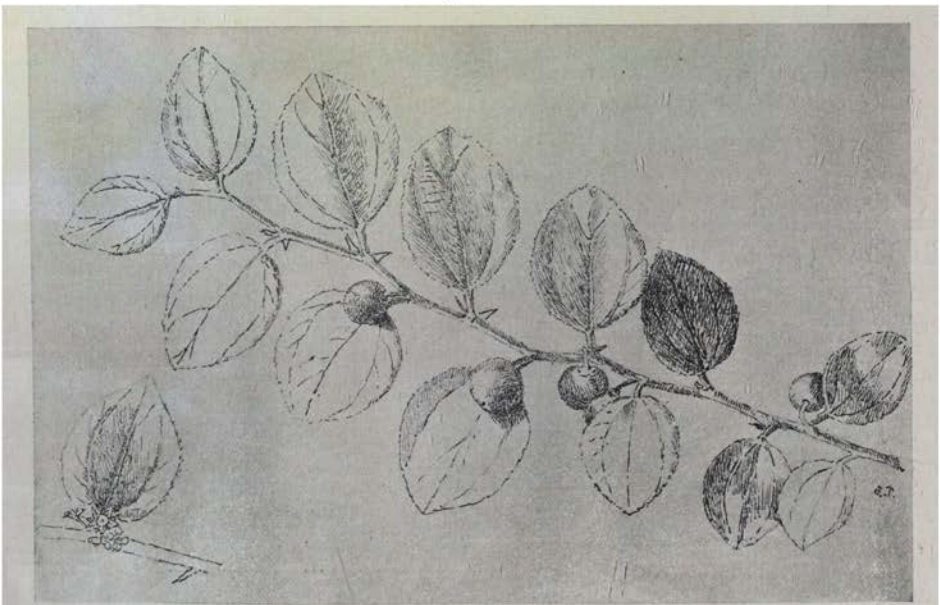


Fig 175. Zizyphus Jujuba, Lamk.

A small tree with drooping branches and tomentose branchlets; stipular-thorns one straight the other curved. Leaves petioled, oblong, ovate or orbicular, obtuse, serrulate, dark-green, shining above, with impressed nerves, white or tawny-tomentose beneath; nerves prominent; blade 1″-2·5″ by ·75″-1·50″; petioles ·5″ long. Cymes axillary, ·75″ long. Flowers greenish-yellow, somewhat fœtid. Calyx-lobes keeled ½-way within. Petals clawed with a hooded limb. Disk fleshy, 10-lobed. Styles 2, thick, connate to the middle. Fruit globose, pedicelled, dark-brown, orange or red when ripe, about ·5″ in diameter with a hard bony, furrowed endocarp.

Wild in some of the Siwalik forests, North-West Provinces, Upper Burmah, Ceylon; the Deccan and Southern India and probably in North Kanara in dry situations. In the Deccan it is abundant in open dry forests mixed with *Acacia arabica*, and other species or sometimes forming nearly pure fringing forests along the banks of rivers, particularly in the eastern districts. *Bor* is also one of the constituents of the isolated spinous thickets on the laterite near the coast of North Kanara; it is found throughout the Bombay Presidency and Sind in dry situations, run wild, also frequently planted as a fruit tree. A moderate-sized, fast-growing, short-stemmed tree with a spreading, rounded crown causing dense shade beneath; very variable in appearance, size and pubescence of leaves and in size, colour and shape of fruit; sometimes attains a large girth and is nearly evergreen. Fl. Mch.-June. Fr. ripe Nov.-Jany. Bark ·5″ thick, dark-grey, nearly black, with long, deep, irregular furrows. Wood hard, reddish; sapwood ¼ of the radius, of a lighter colour. Pores small or moderate-sized, scanty, often oval and sub-divided, frequently joined by wavy, interrupted, fine concentric lines. Medullary rays fine, numerous, equidistant. Weighs about 48 lbs. to the cub. ft. Used for agricultural implements, oil mills, etc. Fruit edible and wild animals including jackals are very fond of it. Bark contains tannin. Furnishes an excellent fuel. Yields good charcoal, material for hedges and the leaves are food for camels and goats. An important and very valuable species in dry regions as it grows on poor soil in rocky and barren localities.

2. Z. trinervia, Fl. Ind 1, 606; Roxb. Hort. Beng. 17 (not of Poir.); Cooke Fl. Pres. Bomb. 1, 241; Gamble Ind. Timb. 182; *Z. glabrata*, Heyne in Roth. Nov. Sp. 159; Fl. Br. I. 1, 633; Wgt. Icones. t. 232.

A small, unarmed tree; shoots and inflorescence pubescent. Leaves coriaceous, glabrous, ovate, acute, mucronate, finely serrate, 3-nerved from the base; blade 1″-2·5″ by ·6″-1″; petioles ·2″-·5″ long; stipules filiform, caducous. Flowers small, yellowish, in axillary, congested cymes about ·5″ long. Calyx pubescent; lobes triangular, keeled within. Petals obovate, truncate at the tip, shorter than the recurved stamens. Filaments flattened. Ovary 2-celled; styles

2, united to above the middle. Fruit rugose, yellowish, 1-2-seeded, globose or obovoid, ·4″ in diameter; pulp sweet, gelatinous.

Western Peninsula, Nilghiris and Mysore. Dr. T. Cooke and Mr. M. Woodrow both found it in Guzerat near Ahmedabad and Surat. It is apparently rare in this Presidency. Gamble describes the wood as smooth, hard, close-grained and olive-brown in colour. Weighs about 40 lbs. to the cub. ft.

3. Z. nummularia, W. & A. Prodr. 162; Fl. Br. I. 1, 633; Brandis For. Fl. 88; Bedd. Fl. Sylv. 69; Dalz. & Gibs. Bomb. Fl. 49; Gamble Ind. Timb. 182; *Z. rotundifolia,* Lamk.; Cooke Fl. Pres. Bomb. 1, 241. *Gangr, jangra,* Sind. *Paraji,* Kan.

A thorny shrub with tomentose flexuous, bifarious, widely divaricating branches. Spines twin, stipular; one straight, slender; the other much shorter, hooked downwards. Leaves shortly petioled, ovate, obtuse, denticulate; main basal-nerves 3, joined by a few prominent, parallel veins on the yellowish tomentose surface beneath; blade 1″-2″ by ·75″-1·25″; petioles ·25″-·5″ long. Cymes very short and compact, about 15-flowered. Petals obovate with convolute margins. Disk 10-lobed with a pit opposite each lobe. Ovary 2-celled; styles 2, nearly distinct. Drupe globose, ·3″ in diameter, red, glabrous, shining when ripe, turns black when dry; stone rugose, 2-celled.

N. W. India, Guzerat, W. Peninsula, Deccan, Konkan, Sind; throughout the Bombay Presidency and Sind in the driest situations; absent from the moist zone near the coast. Fl. March.-June. Fr. Nov.-Jan. An irregular, rounded, low, spreading shrub, often gregarious over large tracts. Bark grey. Wood hard, yellow, close-grained; weighs about 42 lbs. to the cub. ft. Used for dry fences round fields and gardens. The fruit is edible and sometimes during periods of famine furnishes food for starving people. As it is by no means certain that *Z. rotundifolia,* Lamk. is identical with *Z. nummularia,* W. & A. I have retained the latter well known name in use over 60 years.

4. Z. Œnoplia, Mill. Gard. Dict. No. 3; Fl. Br. I. 1, 634; Dalz. & Gibs. Bomb. Fl. 49; Brandis For. Fl. 86; Bedd. Fl. Sylv. 69; Cooke Fl. Pres. Bomb. 1, 242; Gamble Ind. Timb. 183. *Makai,* H.; *Purgi,* K.; *Kaner-balli,* M.

A straggling, climbing, rusty-pubescent shrub; branchlets flexuous, armed with short, straight or curved, usually solitary prickles. Leaves distichous, shortly petioled, ovate or rhomboid, oblique at the base, acute or shortly acuminate, entire or minutely denticulate; nerves strong on the yellowish, tomentose surface underneath; basal-nerves 3-4, veins numerous, prominent, parallel, curving upwards; blade 1″-2·5″ by ·75″-1″; petioles ·25″ long. Cymes very short, axillary, densely tomentose. Flowers glabrous within. Calyx hairy outside; lobes keeled

to the middle. Petals shorter than the calyx, obtriangular, cucculate, longer than the stamens. Disk glabrous with 10, short, pitted lobes. Ovary 2-celled; styles 2, united to about the middle or above it. Drupes ·25″ in diameter, globose, black; nut rugose, usually 1-celled; shell woody or bony.

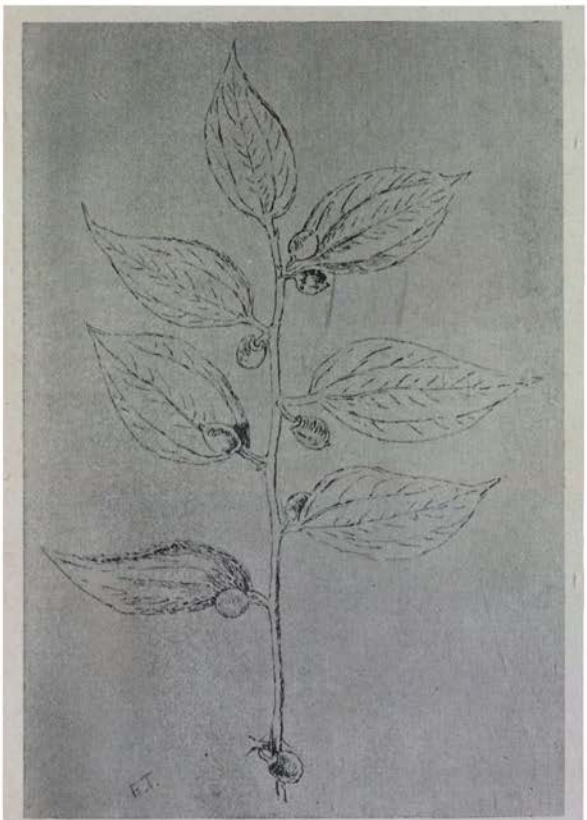


Fig 176. Zizyphus Œnoplia, Mill.

Throughout the hotter parts of India from the Himalayas to Ceylon, Tropical Asia, Australia; throughout the moist monsoon-forests of the Deccan, Konkan and North Kanara, also in hedges and along roads; it is found near the N. Kanara sea-coast on laterite associated with *Z. Jujuba, Lepidagathis prostrata,* etc. Fl. Sept.-Oct. Fr. Feb.-March. A large and extensive climber. Stems 4″-8″ in diameter. Bark rough, dark-grey; rhytidome in thick, irregular, small plates, often in distinct, prominent patches close to the rings of pyramidal prickles. These prickles are made up of brown plates of hard tissue and crowned with the original hooked point. Inner-bark red, fibrous, ·25″ thick. Wood reddish, smooth, close-grained, moderately-hard. Pores numerous, small or moderate-sized, single or in short, radial lines, 3-5 together. Medullary rays very fine and numerous. Annual-rings distinct. Weighs 42 lbs. to the cub. ft. The roots mixed with lemon-juice are used in native medicine for black-tongued remittent fevers. Fruit edible; seeds sometimes made into rosaries. The branches are in common use for temporary fences.

5. Z. xylopyra, Willd. Sp. Pl. 1104; Fl. Br. I. 1, 634; Dalz. & Gibs. Bomb. Fl. 49, Gamble Ind. Timb. 183; Cooke Fl. Pres. Bomb. 1, 242; Brandis For. Fl. 90; Bedd. Fl. Sylv. 68. *Mullu-kare, gorwi, gorchi, godachi,* K.; *Ghot-ber, kanta-gotti,* M.; *Guli,* Vern.

A large straggling shrub or small tree; young branchlets tomentose stipular prickles twin, one straight the other hooked, strong and sharp, sometimes absent. Leaves shortly petioled, ovate or rhomboid, finely serrulate, unequal-sided at the base; basal-nerves 3-4, with numerous, lateral-veins distinct on the glabrescent under surface; blade 1·5″-3″ by 1″-2·25″; petioles ·25″ long. Cymes axillary, on short peduncles, compact; flowers often 4-merous. Calyx pubescent on the outside, glabrous within. Petals clawed, concave, reflexed Disk very thin, 5-angled. Ovary 3-celled; styles 3, short, distinct or more or less united. Drupe globose, seated on a ring formed by the remains of the calyx, about ·75″ in diameter, tomentose when young, glabrous, shining dark-coloured when old; epicarp thick, of brown soft tissue; stone very hard and woody, 2-3-celled, 2-3-seeded.

N. W. India, Central Provinces, Behar and Oudh, in dry parts of Ceylon W. Peninsula from the Konkan southwards; common in the moist monsoon-forests of North Kanara and Konkan; ascending to 4000′ on the Nasik ghâts, common in the Peint forests. Fl. May. Fr. ripe end of rainy season. A small tree, 20′-30′ high. Bark grey or brownish, with thick, angular, exfoliating scales. Wood yellowish-brown, hard, heavy, dense. Pores large and small, surrounded by a white tissue which forms wavy, concentric, irregular, confluent bands. Medullary rays fine, equidistant, numerous. Weighs 60 lbs. to the cub. ft.; easily worked and durable. Used for carts, etc. Makes excellent torches. "The charred fruit is used for dyeing leather black."—Brandis.

VAR. 1 *(microcarpa,)* differs from *Z. xylopyra,* principally in having an entire style with a 3-lobed stigma. Fruit ovoid, pointed or depressed at top, ·5″-·75″ in diameter with a thin or thick pericarp and a very rugose bony nut. A rambling shrub or small tree common throughout the Deccan in dry, deciduous forests, also found near Gokak in the Belgaum district; very closely allied if not identical with *Z. Caracutta,* Roxb. from Mysore; it has however longer petioles than are figured in Roxburgh's original drawing of that species in the Calcutta herbarium. Col. Prain is of opinion that it is probably a distinct species. I have considered it a variety of *Z. xylopyra.*

6. Z. rugosa, Lamk. Dict. III, 319; Fl. Br. I, 1, 663; Dalz. & Gibs. Bomb. Fl. 49; Brandis For. Fl. 89; Bedd. Fl. Sylv. 68; Cooke Fl. Pres. Bomb. 1, 243; Gamble Ind. Timb. 184; Brandis Ind. Trees, 171. *Turan,* M.; *Suna-boorli,* K.

A large scrambling or climbing shrub or small evergeen tree; prickles usually solitary, recurved from a broad base. Leaves elliptic, from a slightly oblique

base, acute or obtuse, glabrescent or more or less covered with hairy tomentum beneath; basal-nerves 3-4, very prominent beneath; veins numerous, strong, parallel; blade 3″-5″ by 1·2″-2·25″; petioles stout, ·5″ long. Flowers densely pubescent in long pedunculate cymes, forming on the usually leafless branches long terminal panicles. Calyx-lobes hairy without, not keeled but with a pilose line within. Petals O. Disk 5-lobed, hairy. Drupe globose, or pear-shaped, about ·5″ in diameter, mealy-white, with a 1-celled, 1-seeded, crustaceous stone.

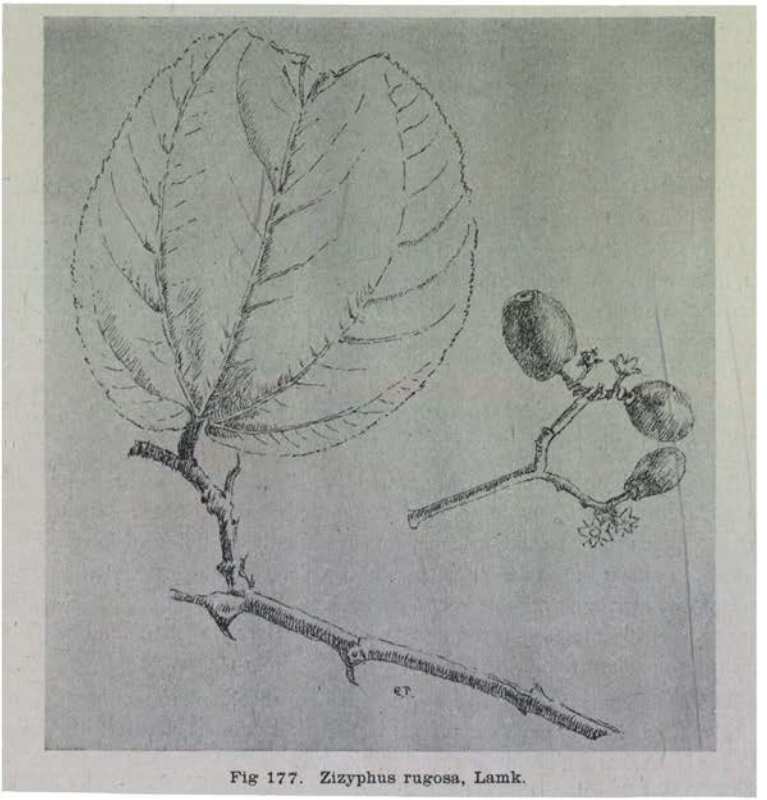


Fig 177. Zizyphus rugosa, Lamk.

Tropical Himalaya, Assam, Burma and the Western Peninsula from the Konkan southwards, Ceylon. Very common in open places on the North Kanara and Konkan ghâts up to 4000′ and elsewhere throughout the presidency; ascends to 3700′ in the Khandesh (Akrani) Satpuras and is very abundant in the vicinity of the Toranmal lake. Fl. Nov.-Mch. Fr. May. Stems sometimes 1′ and more in diameter at the base. On the Nasik ghâts at 4000′, is often a small, evergreen tree with a short, thick trunk and a dense umbrella-

shaped crown of interlaced thick branches. Bark dark-brown, scaly. Wood reddish, tough and hard. Pores large, oval, simple or subdivided. Medullary rays fine, distinct and very numerous. Weighs about 40 lbs. to the cub. ft. Fruit edible; large quantities are eaten by the ghât population during the hot season. The mealy pulp surrounding the crustaceous stone is generally considered very palatable.

Z. horrida, Roth. Nov. Sp. 159; Fl. Br. I. 1, 636; DC. Prodr. II, 20.

Western Peninsula, Wgt.; the Konkan, Bellary; Stocks. I know nothing of this doubtfully indigenous species.

3. RHÁMNUS, L.

Shrubs or trees. Leaves alternate, rarely subopposite; stipules small, deciduous. Flowers hermaphrodite or polygamous, axillary, racemose or in fascicled cymes. Calyx-tube urceolate; limb 4-5-lobed; lobes keeled within. Petals 4-5, or O, inserted on the calyx-tube above the ovary, hooded or flat. Stamens 4-5. Disk thin, lining the calyx-tube. Ovary free, 3-4-celled, narrowed into a 3-4-cleft style. Fruit a berry-like drupe, girt at the base by the small calyx-tube, 2-4-seeded.

R. Wightii, W. & A. Prodr. 164; Fl. Br. I. 1, 639; Bedd. Fl. Sylv. 70; Dalz. & Gibs. Bomb. Fl. 50. *Rugt rorar,* Vern.

A large glabrous, deciduous, unarmed shrub. Leaves subcoriaceous, alternate, 2.5″-4″ by ·8″-1·8″, ovate-oblong, acuminate, closely serrate; serratures with incurved callous tips; nervation conspicuous beneath; petioles ·4″ long. Flowers yellowish, in axillary fascicles or clustered on axillary racemes. Calyx pubescent outside; lobes triangular, keeled on the inner face. Petals minute, flat. Stamens 5. Ovary 3-4-celled; styles 3-4, connate ½-way up. Berry ·2″ in diameter, globose, reddish-purple when ripe.

Western Peninsula; from the highest hills of the Konkan southwards to the Nilghiris, Ceylon. A very rare species in this Presidency. Hitherto found only by Dalzell. A large, glabrous shrub. Bark brown with scattered diamond shape lenticels. Wood brownish-grey, close-grained; heart-wood red. Annual-rings distinct. Pores very small in anastomosing oblique patches of soft tissue. Medullary rays fine, close, prominent in the meshes of the net work. Gamble. Dr. Hooper says the bark is exported to Bombay under the name *Rakta rohida* and furnishes a drug like *Cascara. Rugt rorar*, Dalzell's name for the shrub is apparently the same. Specimens of *R. triqueter*, Wall. have been collected in the "Koriacha Kila," 11 miles south of Lanoula in the Poona district, at an altitude of 3100′. This species also grows on the slopes of the Purandhar hill

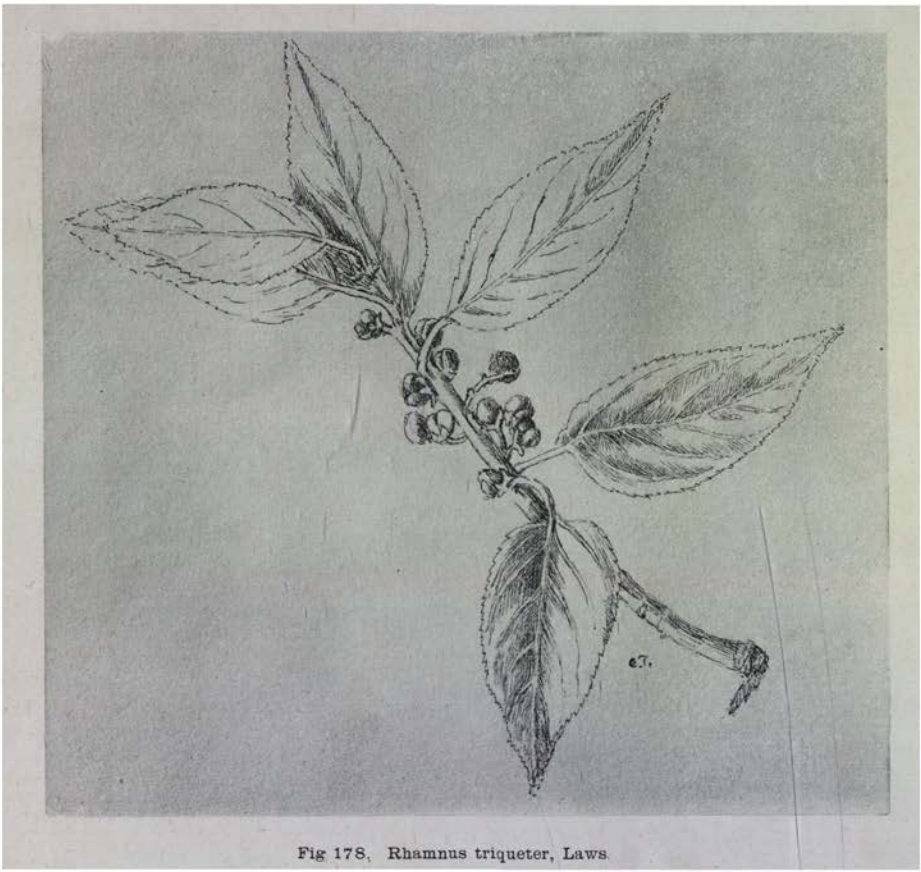


Fig 178. Rhamnus triqueter, Laws.

fort near Poona. It is very like *R. Wightii*, and may have been formerly cultivated in the Deccan for its medicinal qualities. Fr. March-April.

4. SCUTIA, Comm.

A scandent, glabrous, prickly shrub; prickles recurved. Leaves opposite, sub-opposite, or alternate, coriaceous, penninerved. Flowers hermaphrodite, in axillary fascicles or subumbellate. Calyx 5-fid; tube hemispherical or turbinate. Petals 5, emarginate, clawed, flat or hooded. Disk filling the calyx-tube. Stamens 5. Ovary sunk in the disk, 2-4-celled, narrowed into a short 2-3-cleft style. Fruit ovoid or subglobose, girt at the base by the calyx; pyrenes 2-4, crustaceous; seeds compressed; albumen O or thin.

S. indica, Brogn. in Ann. Sc. Nat. X, 363; Dalz. & Gibs. Bomb. Fl. 50; Fl. Br. I. 1, 640; Bedd. Fl. Sylv. 70; Cooke Fl. Pres. Bomb. 1, 241; Gamble Ind. Timb. 187. *Chimat,* Vern.

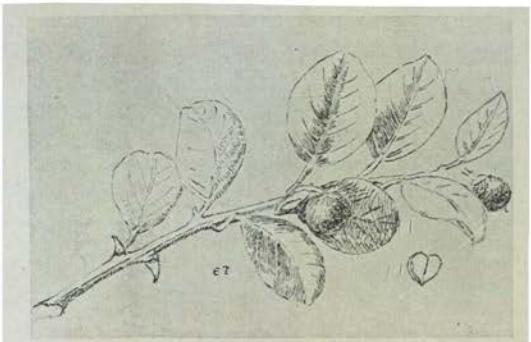


Fig 179. Scutia indica, Brogn

A climbing, straggling shrub; branchlets angular, armed with pairs of hooked, very strong, sharp, axillary prickles. Leaves ovate, orbicular or obovate, obtuse sometimes acute, entire or serrulate; blade ·75″-1·75″ by ·75″-1·25″; petioles ·25″ long. Flowers 5-12 together, in axillary umbellules shorter than the petioles. Calyx globosely campanulate. Petals 5, small, erect, clawed, deeply bifid, as long as the stamens. Stamens enclosed in the petals. Style short. Fruit globose size of a pea, smooth, black, fleshy when ripe; pyrenes 2, lenticular.

Burma, Western Peninsula from the Konkan southwards, Ceylon; on the ghâts of the Konkan, abundant at Mahableshwar and in North Kanara is common in evergreen monsoon-forests near the Tinai ghât at about 2000′ elevation. Fl. Sept.-Oct. and at other times. Fr. June. Stems 4″ in diameter, without thorns or prickles. Bark corky, brown; inner-bark red. Wood reddish-coloured, hard, close-grained. Medullary rays fine and very numerous. Pores in radial lines of 2-4 each.

5. SAGERATIA, Brogn.

Unarmed or spinous shrubs. Leaves sub-opposite with minute deciduous stipules. Flowers small, pentamerous, bisexual, in sessile clusters, arranged on leafless, paniculate branches. Calyx 5-fid; lobes keeled within. Petals 5, clawed, hooded. Stamens 5. Disk cup-shaped, filling the calyx-tube; margin free, 5-lobed. Ovary ovoid, sunk in the disk but free from it, 3-celled; style short, 3-grooved. Fruit globose, 3-seeded, coriaceous, indehiscent; seeds oblong; albumen thin; cotyledons flat.

S. oppositifolia, Brogn. in Ann. Nat. Sc. Ser. I, X, 360; Fl. Br. I. 1, 641; Brandis For. Fl. 95; Gamble Ind. Timb. 188.

North-West India and sub-tropical Himalaya; Western Peninsula from the Konkan southwards. There is only one specimen in the Kew herbarium from the

W. Peninsula, marked "Konkan." Stocks without locality. A large shrub or small tree very doubtfully indigenous in the Bombay Presidency. Flowers in large terminal panicles. Fruit small, turbinate, black, succulent, edible. Fl. R. S. Fr. C. S.

6. COLUBRINA, Rich.

Erect, unarmed shrubs. Leaves alternate; stipules small, deciduous. Flowers in short, axillary cymes. Calyx 5-fid; tube hemispherical. Petals 5, clawed, hooded, inserted on the margin of the disk. Disk fleshy, filling the calyx-tube. Ovary immersed in the disk and confluent with it, narrowed into a 3-partite style; stigmas pappilose, reflexed. Fruit obsoletely 3-lobed, surrounded at the base by the calyx-tube, 3-celled; cells 1-seeded, tardily dehiscent; seeds compressed, trigonous; albumen thin, fleshy; cotyledons orbicular.

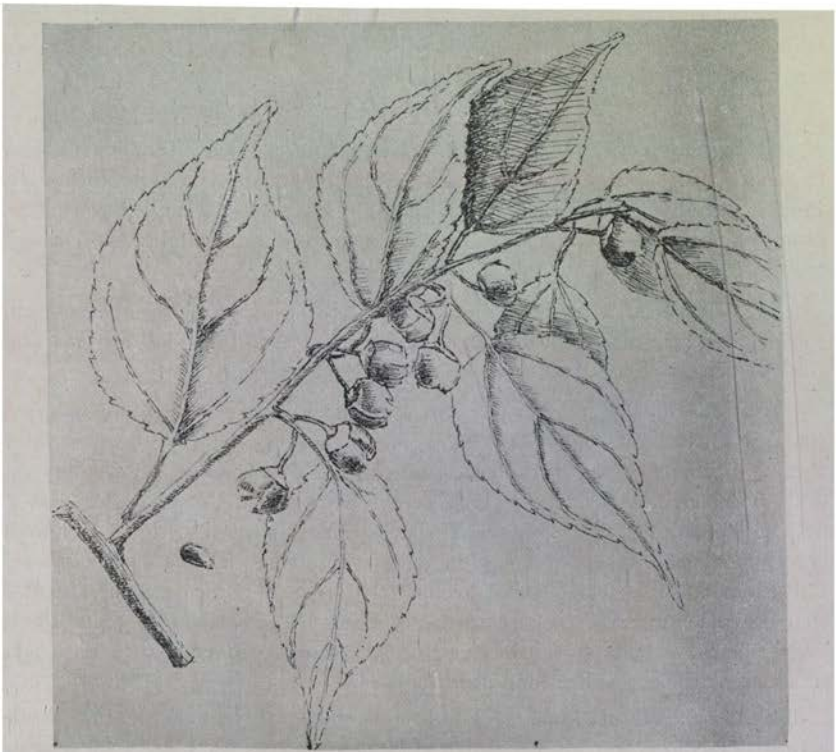


Fig 170. Colubrina asiatica, Brogn.

C. asiatica, Brogn. in Ann. Sc. Nat. Ser. I, X, 369; Fl. Br. I. 1, 642; Dalz. & Gibs. Bomb. Fl. 50; Bedd. Fl. Sylv. 69; Cooke Fl. Pres. Bomb. 1, 246; Gamble Ind. Timb. 188. *Guli,* M.

An unarmed, glabrous shrub. Leaves thin, broadly ovate, acute or acuminate, crenate-serrate, rounded or subcordate at the base, 3″-1·75″ by 2″-1″; petioles ·5″ long. Flowers very small, yellowish, in axillary shortly peduncled cymes. Calyx-lobes acutely triangular, broad at the base, ridged on the inner face. Petals cucculate, as long as the calyx-lobes, enclosing the stamens. Disk thick, mammilated, 5-angled. Ovary 3-celled. Capsule brown, size of a pea, globose, smooth; seeds smooth, dark-brown, dorsally rounded, ventrally triangular, ·2″ long.

Eastern and Western Peninsulas in the coast forests from the Konkan and Tenasserim southwards. Ceylon. Elephanta and the ghâts, plentiful near the sea at Ratnagiri. Dalz. & Gibs. Bark thin, grey, slightly rough. Wood hard; sapwood white; heartwood orange-pink, with a silvery grain. (Gamble).

7. GOUANIA, LINN.

Unarmed, tendril-climbing shrubs. Leaves alternate. Flowers in axillary or terminal spikes, polygamous. Calyx 5-lobed; the tube adherent to the ovary. Petals 5, hooded. Stamens 5. Disk filling the calyx-tube, 5-angled or stellate. Ovary immersed in the disk, 3-celled; style 3-cleft. Fruit inferior, coriaceous, 3-winged.

1. G. microcarpa, DC. Prodr. 2, 40; Fl. Br. I. 1, 643; W. & A. Prodr. 167; Cooke Fl. Pres. Bomb. 1, 246; Gamble Ind. Timb. 189; *G. leptostachya,* Dalz. & Gibs. Bomb. Fl. 50, (not of DC.); *Shingar-balli,* K.

A shrub, climbing by circinate, axile or extra axillary watch-spring tendrils; young branches and inflorescence white-tomentose. Leaves broadly-ovate, abruptly-acuminate, subcordate, crenate-serrate or nearly entire, rufous-hairy on the nerves above and beneath; lateral-nerves 5 pairs, arching, parallel; blade 2″-3″ by 1″-2″; petioles ·25″-·5″ long, rufous-pubescent. Spikes 6″-9″ long. Flowers bracteolate, small, fascicled along the pubescent rachis which is often cirrhose. Calyx tomentose outside, glabrous within. Petals small, concave, enclosing the stamens and anthers. Disk tomentose. Fruit ·3″ across with 3 short, thick lobes rounded at both ends, consisting of 3, serrate, coriaceous carpels; seeds ·1″ broad, flattened, with a central rib.

Western Peninsula from the Konkan southwards, common on the North Kanara ghâts in evergreen monsoon and rain-forests. Fl. and Fr. cold season. Wood yellowish, rather hard, very similar to that of *Ventilago calyculata.* The

diameter of the large oval, simple or divided pores is greater than the distance between the rays, causing them to present a wavy appearance. Annual-rings distinct. Weighs about 40 lbs. to the cub. ft.

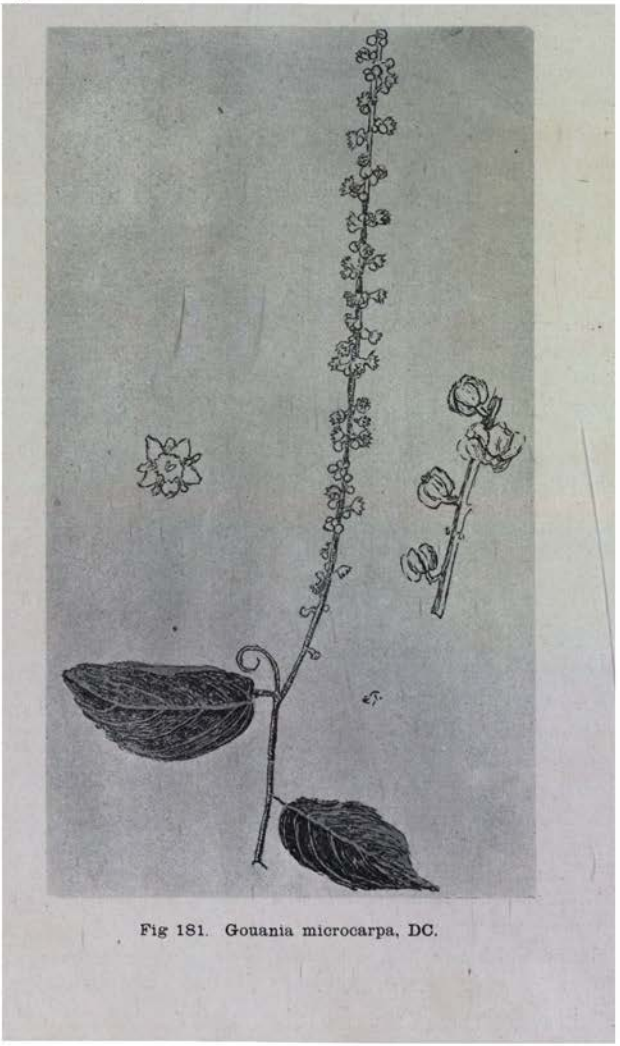


Fig 181. Gouania microcarpa, DC.

Order XXXII.—AMPELIDEÆ.

Erect shrubs or small trees with jointed branches; sometimes herbaceous or woody climbers furnished with simple or branched tendrils. Juice copious, watery. Leaves alternate or the lower opposite, simple or compound. Flowers small, regular, hermaphrodite, rarely unisexual, in cymose paniclés, spikes or racemes. Calyx small, entire, 4-5-dentate or-lobed. Petals 4-5, hypogynous, valvate, free or variously cohering. Stamens as many as the petals and opposed to them on the outside of the disk; anthers free and distinct or connate. Disk hypogynous, free or connate with the petals stamens or ovary. Ovary 2-6-celled; ovules 1-2 in each cell, erect, anatropous; style simple, short or O; stigma minute or flat and lobed. Fruit a 1-6-celled berry; cells 1-2-seeded. Seeds erect, often rugulose; testa bony; albumen copious, cartilaginous often ruminate; embryo short, basal; cotyledons ovate; radicle inferior.

Scandent shrubs usually with tendrils. Ovary 2-9-celled; cells 2-ovuled ... ... 1. Vitis.

Erect shrubs, or large herbs. Ovary 3-6-celled; cells 1-ovuled ... ... 2. Leea.

1. VITIS, LINN.

Shrubs climbing by means of leaf-opposed tendrils. Leaves simple, pedately or digitately 3-9-foliate. Flowers variously cymose, hermaphrodite, unisexual or polygamous, usually without bracts. Calyx short, entire, 4-5-lobed. Petals 4-5, free or cohering at the apex. Stamens 4-5; filaments free, inserted below the margin of the disk; anthers free. Ovary 2, rarely 3-4-celled; style O or short; ovules 2 in each cell. Fruit a 1-4-seeded, often watery berry.

Leaves simple.

Cymes corymbose, usually umbellate.

Flowers tetramerous.

Stems and branches acutely angled or winged.. 1. V. quadrangularis.

Stems cylindric or obscurely winged.

Leaves glabrous.

Branches terete, mealy-white ... ... 2. V. repens.

Branches 6-angled, bright-red ... ... 3. V. discolor.

Branches thick, fleshy, hollow ... ... 4. V. pallida.

Branches cylindric, glaucous, faintly striate ... 5. V. glauca.
Leaves ovate, more or less pubescent or tomentose beneath.
Leaves subtomentose beneath ... ... 6. V. gigantea.
Leaves when young adpressed, woolly rufous-tomentose beneath ... ... 7. V. repanda.
Leaves orange-red pubescent beneath... ... 8. V. adnata.
Leaves 3-5-lobed, grey-tomentose beneath ... 9. V. Linnæi.
Flowers pentamerous. Cymes usually on the tendril, umbellate, paniculate or spikate.
Cymes umbellate, white-woolly ... ... 10. V. tomentosa.
Cymes paniculate.
Flowers glabrous; peduncles with a forked tendril ... ... 11. V. latifolia.
Flowers tomentose; peduncles without tendrils 12. V. vinifera.
Cymes spikate, densely red-woolly tomentose ... 13. V. indica.

Leaves trifoliate.
Flowers tetramerous.
Stems and leaves fleshy.
Plant quite glabrous. Fruit 1-seeded; seed quite smooth ... ... 14. V. Rheedii.
Plant covered with glandular bristly hairs.
Fruit 1-seeded; seed nearly smooth ... ... 15. V. setosa.
Plant covered with dense, short pubescense.
Fruit black, 4-seeded; seeds tubercled ... 16. V. carnosa.
Flowers pentamerous.
Stems woody. Leaves 3-5-pedately foliate, at length glabrous. Fruit globose or ovoid ... 17. V. canarensis.
Stems slender. Leaves with white, floccose tomentum. Fruit oblong, subfalcate ... 18. V. araneosa.

Leaves 5-11-foliate, digitate.
Plant quite glabrous. Leaflets nearly sessile.
Fruit black ... ... 19. V. elongata.
Plant with the young parts softly pubescent.
Leaflets long-stalked. Fruit red, turning dark-purple ... ... 20. V. auriculata.

Leaves pedately 5-foliate.
Flowers hermaphrodite. Style simple.
Leaves 5-7-foliate, glabrous ... ... 21. V. tenuifolia.

Leaves 7-11-foliate, pubescent, hairy ... ... 22. V. pedata.

Flowers diœcious. Stigma sessile, 4-lobed.

Leaves thin; venation open ... ... 23. V. lanceolaria.

Leaves coriaceous; venation close, reticulate ... 24. V. reticulata.

1. V. quadrangularis, Wall. Cat. 5992; Fl. Br. I. 1, 645; Wight Ic. t. 51; Brandis For. Fl. 100; Trimen Fl. Ceylon 1, 289; Cooke Fl. Pres. Bomb. 1, 250; *Cissus quadrangularis*, Linn.; Planch. Suites Prodr. V, 509; Dalz. & Gibs. Bomb. Fl. 39; *C. edulis*, Dalz. & Gibs. Bomb. Fl. 40. *Hursanker, nallar, chaudhari, harjora, kandawel,* Vern.; *Hiressa*, Sind. *The Edible-stemmed Vine.*

Stems succulent, glabrous, 4-winged or angled and much constricted at the nodes, sometimes very long and leafless when old. Leaves fleshy, glabrous, varying from broadly cordate and deeply 3-7-lobed to entire, crenate-serrate; blade 1·5″-2″ long; petioles ·25″-·5″ long; stipules small, ovate, obtuse; tendrils long, slender, leaf-opposed, usually simple. Cymes small, umbellately branched, shortly peduncled, glabrous. Calyx cup-shaped, truncate or obscurely lobed. Petals 4, ovate-oblong, acute, hooded at apex. Disk 4-lobed, longer than the glabrous ovary. Style slender; stigma small. Berry globose, red, succulent, very acid, 1-seeded; seed obovoid, smooth, ·4″ by ·2″; albumen white, firm.

Tropical and subtropical India, Eastern Africa and the Malay Archipelago; throughout the driest districts of the presidency, from Guzerat to Dharwar. A large climber. The variety with winged branches found in Guzerat (*C. edulis,* of the Bomb. Fl.) with lunate stipules and fibrous roots Dalzell keeps separate from C. *quadrangularis,* which has tuberous roots and auricled stipules. The leaves and young shoots are eaten in curries. Fl. R. S. Fr. C. S.

2. V. repens, W. and A. Prodr. 125; Fl. Br. I. 1, 646; Cooke Fl. Pres. Bomb. 1, 249; Brandis Ind. Trees 177; *Cissus repens*, Lam.; Planch. Suites au Prodr. V, 504; Dalz. & Gibs. Bomb. Fl. 39; *C. cordata*, Roxb. Fl. Ind. 1, 407; Grah. Cat. Bomb. Pl. 32.

A large, glabrous and glaucous climber. Leaves cordate, broadly-ovate, acuminate, glabrous, dentate-crenate; membranous; serratures softly spinous; blade 8″-3″ by 3·5″-1″; main lateral-nerves about 4 pairs, the lower pair pedately 5-7-nerved at the base; petioles about 2.5″ long; stipules small, cordate; tendrils leaf-opposed, forked. Flowers red; buds conical, in very large, corymbose, compound umbels; peduncles leaf-opposed, usually solitary, 1″-2.5″ long; pedicels slender. Fruit black, pulpy, size of a small cherry, edible; seed ·5″ long, pyriform, rugose on the sides; pedicels lengthened in fruit, ·75″ long.

Eastern tropical Himalaya, Khasia, Assam and Silhet, and the Malay Archipelago. Very common in monsoon-forest on the North Kanara and Konkan Ghâts. Fl. March when bare of leaves. Fr. May.

3. V. discolor, Dalz. in Hook. Kew Jour. Bot. 2, 39; Fl. Br. I. 1, 647; Cooke Fl. Pres. Bomb. 1, 250; Brandis Ind. Trees. 176; *Cissus discolor*, Dalz. & Gibs. Bomb. Fl. 40; Planch. Suites au Prodr. V. 496. *Telitsayel*, M.

A slender, weak-stemmed, glabrous climber; stems and branches acutely angled, bright-red. Leaves obliquely ovate or oblong-lanceolate, acuminate, truncate or slightly cordate at the base, serrate, deep velvetty-green, blotched with white above, purple and shining beneath, thin; blade 3″-12″ by 1″-4″; stipules broadly ovate, obtuse; tendrils forked. Flowers 4-merous, red, in copious leaf-opposed umbels; buds oblong. Calyx truncate. Petals red, hooded at apex, glabrous. Berries black, shining, 1-seeded, about the size of a large pea; seed ·2″ long, pear-shaped; chalaza prominent, ridged on both sides.

Tropical Himalaya, Khasia and Silhet, Lower Burmah, Andamans, Malay Peninsula and Java; throughout the moist forests of the Konkan and North Kanara, cultivated in gardens throughout the tropics. A very ornamental plant, easily and readily distinguished from other species of *Vitis*. Fl. Aug-Sept. Fr. Oct.-Nov.

4. V. pallida, W. & A. Prodr. 125; Fl. Br. I. 1, 647; Cooke Fl. Pres. Bomb. 1, 249; Brandis Ind. Trees 176; Gamble Ind. Timb. 190; Trimen Fl. Ceylon, 1, 291; *V. Woodrowii*, Stapf; Cooke Fl. Pres. Bomb. 1, 248; *Cissus pallida*, Planch. Suites au Prodr. V, 477; *C. vitigenea*, Roxb. (non Linn.) Dalz. & Gibs. Bomb. Fl. 40. *Kondagu-mara*, Kan.; *Girnal.* M.

A pubescent or nearly glabrous, erect shrub or small tree, often without tendrils, sometimes climbing; branches thick, hollow, glaucous. Leaves sparingly tomentose when young, broadly cordate, with a wide sinus, dentate-serrate, (serratures glandular, incurved), often repand or 3-lobed, shortly acuminate, entire, pellucid when young; blade 3″-6″ across; petioles 1·5″ long; stipules cordate; tendrils when present, simple. Cymes on long, stout peduncles, 3-5-branched; branches recurved in fruit; pedicels ·2″ long, tomentose; bracts and bracteoles large, glabrous and pellucid. Calyx saucer-shaped with thin margins. Petals distinct. Style conspicuous, slender; stigma capitate. Fruit ·5″ in diameter, subglobose or pyriform, black when ripe, usually 1-seeded; stalk fleshy; seeds pyriform, smooth.

Throughout the Deccan and in dry rocky situations of the Western peninsula generally; common in the warmer regions of Ceylon. A widely spread, conspicuous species. Usually an erect, glaucous shrub with a short hollow, thick stem and pale corky bark, sometimes a tendril-climber in favourable situations. The amount of pubescence is variable. Fl. R.S. Fr. ripe C.S. Associated on the Deccan plains with *Capparis aphylla, Cassia auriculata, Calotropis,* etc. Without foliage early in January.

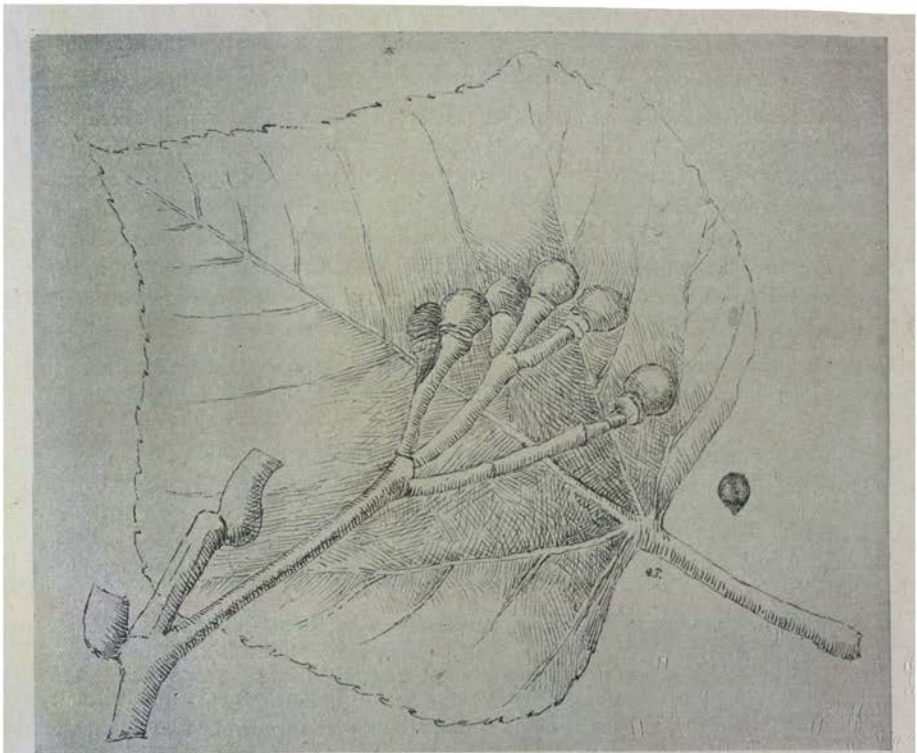


Fig 182. Vitis pallida, W. & A.

Gamble describes the wood as reddish-brown, soft. Pores small or large, very scanty, scattered in the cellular tissue between the very broad, red, pithy medullary rays.

5. V. glauca, W. & A. Prodr. 126; Fl. Br. I. 1, 648; Brandis Ind. Trees 176.

A glaucous, glabrous climber. Leaves ovate, broadly cordate, acuminate, cuspidate, bristly and rather distantly serrate, membranous; blade 2″-4″ by 1″-2·5″; petioles 1·5″-3″ long, slender; stipules broad, reniform, glaucous; tendrils forked. Flowers small, on 2″-3″-long, umbellately rayed peduncles; bracts and bracteoles very small, deciduous. Fruit subglobose, black when ripe, size of a pea; seed globose, ·1″ in diameter, 3-ribbed, smooth.

Western Peninsula from the Konkan southwards. In the rain-forests

of the Konkan and North Kanara, not common. Fl. Fr. Apl.-May. This species has been united with *C. repens,* Lamk., the *Vitis repens*, of the Fl. Br. I. by Planchon in the Suites au Prodr. Syst. Nat. Sir G. King is of the same opinion : vide Materials for a Flora of the Malay Peninsula 1, 400. I venture to keep *V. glauca,* distinct from *C. repens,* Lamk. *V. repens,* is found in open deciduous forest, whereas the slender-stemmed *V. glauca,* is as far as I have seen, entirely confined to dense rain-forest.

6. V. gigantea, Bedd. in Trans. Linn. Soc. XXV, 212; Fl. Br. I. 1, 648; Cooke Fl. Pres. Bomb. 1, 250; *Cissus gigantea,* Planch. in DC. Mon. Phan. 5, 622.

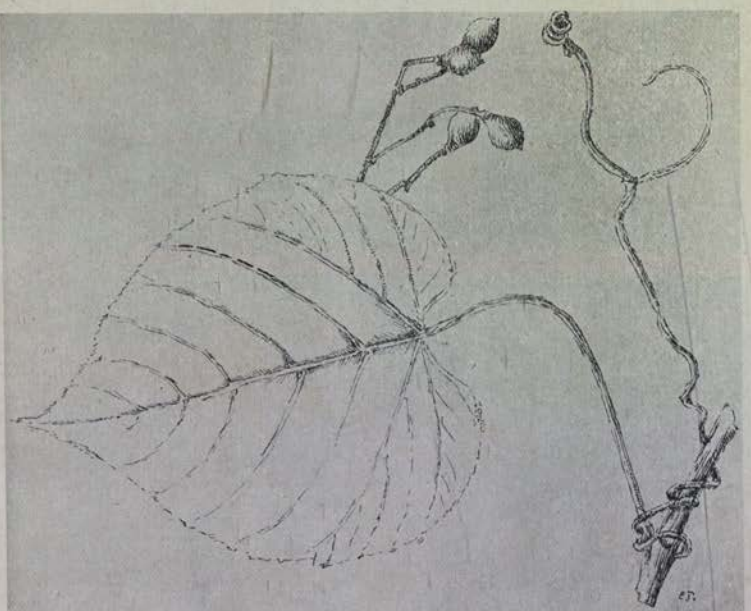


Fig 183. Vitis gigantea, Bedd.

A large climber; branches glabrous. Leaves broadly ovate; blade 3″-6″ by 3″-4·5″, exactly cordate with a deep sinus, shortly cuspidate-acuminate, minutely and sharply crenate-serrate, glabrous above, more or less tomentose beneath; with 5 basal-nerves; midrib with 7, opposite, lateral-pairs of nerves; reticulation prominent; petioles about 3″ long; stipules small, entire, caducous; tendrils stout, leaf-opposed, forked. Flowers small, greenish-yellow, in 3-5-rayed cymes; inflorescence shorter than the petioles, pubescent. Fruit

1-seeded, pear-shaped, ·5″ long, black when ripe; peduncles and pedicels lengthened in fruit; seed ·25″ long, irregularly polygonal areolate. A distinct species, common throughout the moist evergreen forests of North Kanara from the sea-level upwards, also in the Konkan; probably endemic in the Western Peninsula. A large climber with corky bark and terete, glabrous branches.

7. V. repanda, W. & A. Prodr. 125; Fl. Br. I. 1, 648. Cooke Fl. Pres. Bomb. 1, 251; *Cissus repanda,* Vahl.; Dalz. & Gibs. Bomb. Fl. 39; Planch Suites au Prodr. V, 474.

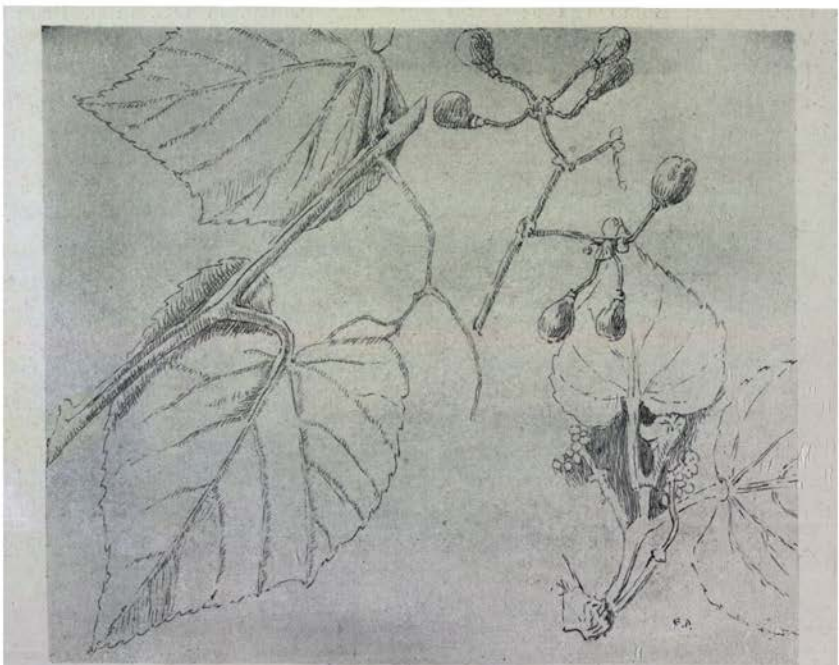


Fig 184. Vitis repanda, W. & A.

A stout climber; young parts with adpressed, reddish-woolly tomentum. Leaves thin, broadly cordate, coarsely serrate or dentate, sublobed, often repand, densely rufous-tomentose beneath, at length glabrous above and sparsely hairy beneath; blade 10″-3″ by 10″-3″ with 5-basal nerves; petioles up to 1·5′ long, thick, flattened on the upper surface; stipules small, entire, densely woolly; tendrils when young slender and much branched. Cymes rather slender with 3-5 rays; the flowers ultimately umbellate. Calyx truncate, red-hairy outside. Petals 4, pink, free at apex, adpressed hairy in bud. Filaments short, inserted

between the lobes of the disk. Style long, glabrous; stigma capitate. Fruit ·3″ long, pyriform, 1-seeded, tipped with the persistent style; pedicels sometimes reflexed; seeds obovoid, smooth, rather flattened.

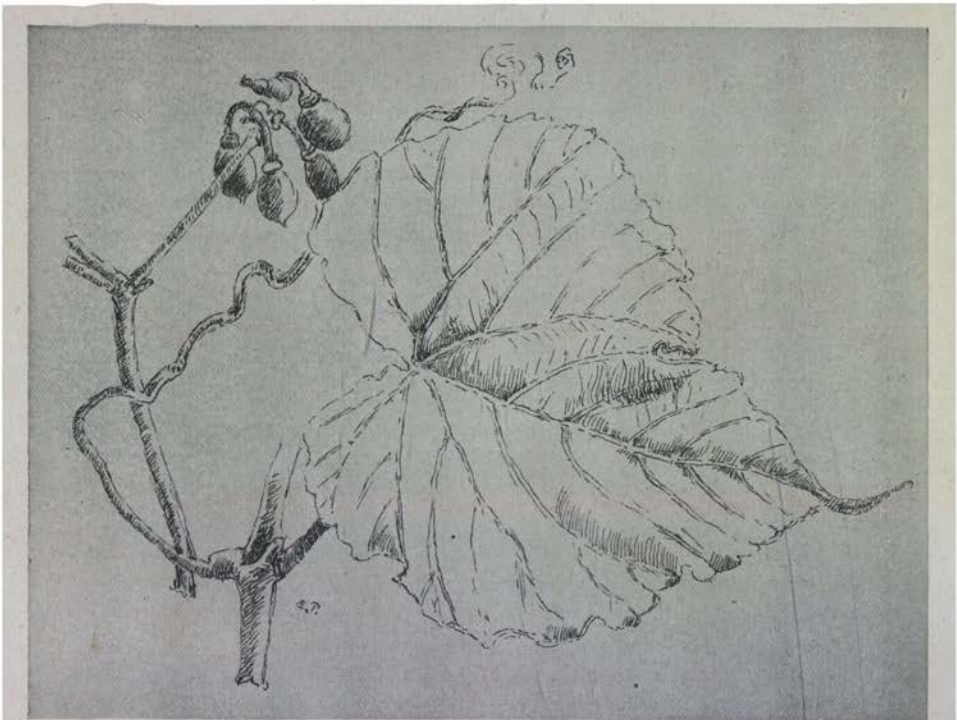


Fig 185. Vitis repanda, W. & A.—*Fruit.*

Common throughout the presidency along the border of the heavy rainfall zone, also in some of the high-timber monsoon-forests of N. Kanara; in the Khandesh Satpudas (ascends to 3700′ in the Akrani); generally distributed throughout the Deccan and Konkan. A large, thick-stemmed climber with corky, fissured bark, doing considerable damage to the teak and other trees. Fl. Mch.-Apl. Fr. Apl.-May. New foliage along with or after the flowers.

Sir G. King says that this common Bombay forest species is *V. Wightiana*, Wall. and closely allied to *V. repanda*, W. & A. Wight and Arnott in their Prodr. Fl. Penin. I. however reduce *V. Wightiana*, Wall., to their *v. repanda*. Lawson in the Fl. Br. I. does not refer to *V. Wightiana*, at all. I venture to retain the name *V. repanda*, for our Bombay plant until a revision of the genus definitely settles the position and relationships of *V. repanda* & *V. Wightiana*.

8. V. adnata, Roxb. Fl. Ind. 1, 405; Fl. Br. I, 1, 649; Dalz. & Gibs. Bomb. Fl. 32; Cooke Fl. Pres. Bomb. 1, 251; Brandis For. Fl. 100; *Cissus adnata,* Roxb. Fl. Ind. 405; Planch. in DC. Mon. Phan. 5, 494. *Nandan* M.; *Kole-zan*, Vern.

A large, woody climber; young parts, inflorescence etc. covered with dense orange-red pubescence. Leaves ovate, cordate, acute or shortly acuminate, bristly-serrate, persistently orange-red pubescent or tomentose beneath, ultimately glabrescent above, membranous; blade 4″ by 2″; petioles 1″-4″ long; stipules small, sub-orbicular, adnate to base of petiole; margins scarious. Cymes smaller and more compact than in *V. repanda.* Flowers yellowish-green, red in bud. Petals distinct. Style short. Fruit small, globose or pyriform, ·25″-·4″ long, black; pedicels recurved; seed small, pyriform, with pitted sides and a prominent chalaza.

Tropical Asia, Peninsular India, Malay Peninsula, Ceylon, Phillipine Islands; throughout the Western Peninsula, Deccan, Konkan, Assam, Bengal and Upper Burmah, North Kanara in the moist monsoon-forests from Kadra to Goond, but nowhere common. Flowers and fruits during the cold and hot seasons. New foliage appears during May.

9. V. Linnæi, Wall. Cat. 5987, Fl. Br. I. 1, 649; W. & A. Prodr. 126; Cooke Fl. Pres. Bomb. 1, 252; Brandis Ind. Trees 176; *Cissus vitiginea*, L.; Planch. in DC. Prodr. (Suites au) V, 472.

A robust, erect or climbing shrub; leaves and young parts covered with dense grey-pubescence. Leaves ovate, sub-rotund, obsoletely pentagonal, palmately 3-5-angled or lobed, broadly cordate, or truncate at the base, covered with short, white hairs above, densely grey or brown-tomentose beneath, coarsely and irregularly serrate, rather thick; blade 5·5″-1·75″ by 5″-2″; stipules small, deciduous; tendrils simple, pubescent; near the base stout, woody. Flowers small, in peduncled, umbellate cymes with unequal branches and sometimes about as long as the leaves. Calyx truncate or shallow-lobed, hairy outside. Petals hairy outside, hooded at apex. Disk fleshy, grooved. Style longish, conspicuous. Fruit oblong, bluish, glaucous, ·3″ long, 1-seeded; seed obovoid, rough.

Western Peninsula from the Konkan southwards, Bijapur district near Badami; Ceylon in dry localities. A climbing shrub or small tree with a thick trunk and deeply fissured, corky bark. Fl. June-Oct. Fr. C. S.

10. V. tomentosa, Heyne in Roth. Nov. Sp. 157; Fl. Br. I. 1, 650; W. & A. Prodr. 130; Cooke Fl. Pres. Bomb. 1, 252; Brandis Ind. Trees. 176; *V. triloba*, Heyne l. c. 157; DC. Prodr. 1, 634; *Ampelocissus tomentosa,* Planch. Mon. Phan. DC. Prodr. (Suites au) v, part 2, 376.

A climbing shrub; young parts, branches, petioles, peduncles etc. covered with dense, persistent white or reddish, flocculent tomentum. Leaves palmately-

3-5-angled or lobed; base cordate with a moderately wide sinus, densely reddish-tomentose; lobes closely toothed, usually acute; blade 3″-9″ long, as broad or sometimes broader; petioles 1·5″-3″ long; stipules small, densely felted-tomentose. Flowers small, scarlet, sessile, in short, peduncled, compact, woolly cymes; peduncles long, stout, converted into a forked or branched, woody tendril at the end. Calyx 5-lobed, thin, membranous, woolly outside, covering over the petals

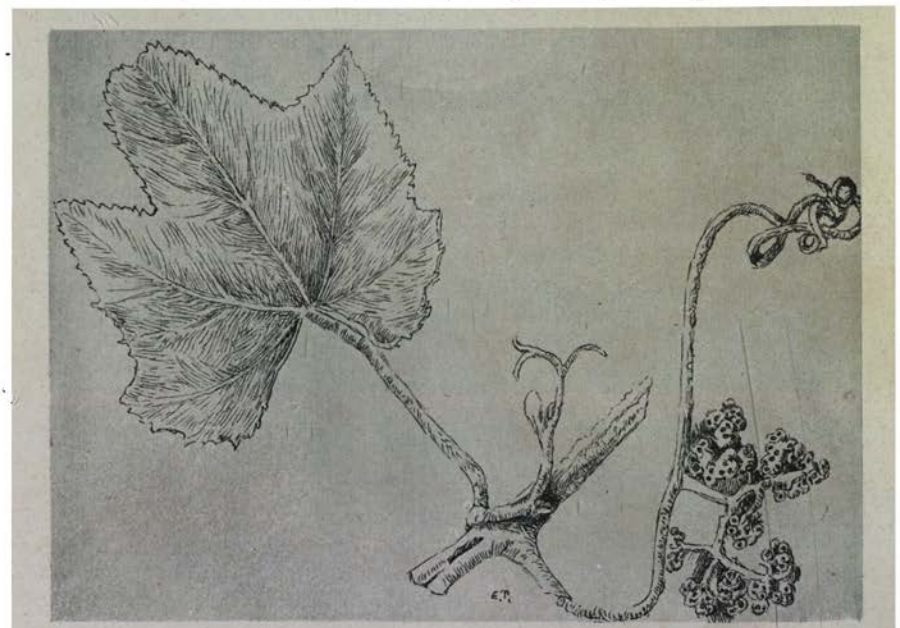


Fig 186. Vitis tomentosa, Heyne.

in bud. Petals 5, glabrous, not cohering at the apex. Ovary conical, 10-furrowed at the apex; style 0; stigma foveolate. Fruit ·3″ in diameter, black, globose; seed broadly oblong, flat, with an incurved margin, face with a central ridge.

Western peninsula from the Konkan to the Nilghiris, Burmah; throughout the dry forests on the North Kanara border in the Mundgode sub-division; common in the forests of the Dharwar district near the banks of streams and rivers. Fl. Mch. Fr. May.

11. V. latifolia, Roxb. Fl. Ind 1, 661; Fl. Br. I. 1, 652; Brandis For. Fl. 99; W. & A. Prodr. 130; Cooke Fl. Pres. Bomb. 1, 253; *Ampelocissus latifolia,* Planch, DC. Prodr. (Suites au) v, 370. *Nandena, koland,* M.

A weak, hollow-stemmed, glabrous climber; young leaves and shoots sometimes pubescent. Leaves orbicular, broadly cordate, angular or sinuous, 3-5-lobed, unequally sharply repand-dentate, 5-basal-nerved, membranous; blade 4″-6″ across; petioles 1″-2″ long; stipules minute. Flowers very small, reddish-brown, in small, thyrsoid cymes; peduncles terminating in a long wiry, branched tendril. Calyx small, truncate. Petals 5, distinct. Anthers yellow. Ovary 10-sulcate; style 0; stigma cup-shaped. Fruit black, 2-seeded, elliptical, ·4″ long; seed with rugose margins and a linear tubercule on the back, bluntly ridged on the face.

N. W. India, Assam, Silhet, Rajputana, Bengal, Behar, W. Peninsula from the Konkan southwards; common in N. Kanara monsoon-forest near Karwar also on the ghâts. Flowers from June to Aug. Fr. Oct. The fruit of this species is edible but rather tasteless. The foliage resembles somewhat that of the cultivated vine.

12. V. vinifera, Linn. Sp. Pl. 202; Fl. Br. I. 1, 652; Brandis For. Fl. 98; Dalz. & Gibs. Bomb. Fl. Suppl. 15. *The Grape Vine. Draksha,* Vern.

Cultivated in the drier districts of the Presidency principally near Ahmednagar and Nasik. The quality of the Deccan grapes is good and the produce of the extensive vineyards near Nasik town finds a ready sale in the Bombay market during the hot season. Excellent grapes are also grown in Sind.

13. V. indica, Linn. Sp. Pl. 202; Fl. Br. I. 1, 653; Dalz. & Gibs. Bomb. Fl. 41.; Brandis For. Fl. 100; W. & A. Prodr. 131; Cooke Fl. Pres. Bomb. 1, 253; *Ampelocissus Arnottiana,* Planch.; DC. Prodr. (Suites au) v, 379. *The Indian Wild-Vine. Ran-draksha, nardel, kolejan,* M. *Huttige-balli,* K.

A large, red-villous climber. Leaves hard, firm, broadly ovate, scarcely angled, cordate, acute, or shortly acuminate, denticulate-serrate, (serratures subspinous), tomentose at least on the nervation beneath, glabrescent at length above; blade 4″-10″ by 3″-8″; petioles 1·5″-3″ long. Flowers greenish-purple, shortly pedicelled, in short, cylindrical spikes of sessile umbels; peduncles terminating in a stout, bifid tendril. Calyx small, truncate. Petals oblong, ·1″ long. Ovary grooved. Fruit ·75″ long, ovoid-oblong, size of a large black currant, 1-4-seeded. Seeds ·25″ long, flattened, tubercled on the thickened edges and front, which has a small cup-like depression; back with a thick wedge-shaped chalazal ridge.

Western Peninsula from the Konkan southward, Central India and Bengal; in the evergreen rain and monsoon-forests of the North Kanara and Konkan ghâts. Fl. and Fr. from Aug. till Jan. The tuberous root is used in native medicine, Reede Hort. Mal. VII, 11. Grapes sweet and palatable.

14. V. Rheedii, W. & A. Prodr. 127; Fl. Br. I. 1, 653; Cooke Fl. Pres. Bomb. 1, 254; *Cissus trilobata,* Lamk. Dalz. & Gibs Bomb. Fl. 39; Graham Cat. 33; W. & A. Prodr. 126; Planch. DC. Prodr. (Suites au) v, 503.

A thick, weak-stemmed, climbing or spreading shrub, quite glabrous. Leaves trifoliate, 3-lobed or entire; leaflets oblong-lanceolate, sharply acuminate, lateral very oblique, all distantly and sharply toothed; blade 2″-5″ long; petioles 2″-3″ long; petiolules short or O; stipules ovate; tendrils simple, woody. Flowers 4-merous, sub-umbellate in divaricating cymes, usually shorter than the petioles. Petals distinct. Style slender, conspicuous. Fruit globose, size of a currant, 1-seeded; seed globose, girt with a ring round the middle, ·25″ in diameter, smooth.

Western Peninsula, Malabar and Travancore, Konkan, Ceylon. Dalzell and Graham both give the Konkan as a habitat of this species; I have not found it myself.

15. V. setosa, Wall. Cat, 6009; Fl. Br. I. 1, 654; Cooke Fl. Pres. Bomb. 1, 254; *Cissus setosa*, Dalz, & Gibbs. Bomb. Fl. 41; Planch, DC. Prodr. (Suites au) v, 608. *Harmal* H.; *Khajgol-ka-vel,* M.

A fleshy, herbaceous, weak, spreading plant with heavy sulcate flaccid stems covered with long glandular, bristly hairs, but without any other pubescence. Leaves sessile, 3-foliate; leaflets sessile or shortly stalked, ovate or sub-ovate, cuneate-obtuse, bristly erose-dentate; blade 1·5″-3″ by 1″-2″, shortly-petioluled; petiolule of terminal leaflet longest; stipules ovate; tendrils fleshy, forked. Flowers usually in leaf-opposed, divaricating peduncled, branched cymes; peduncles 1·5″-3″ long, glandular-hispid. Calyx cup-shaped, truncate. Corolla urceolate, constricted in the middle; petals hooded at tips, at length reflexed. Torus 4-lobed at the top. Style conspicuous. Berries red, glandular-bristly when young, size of a pea, very acrid; seed globose, nearly smooth.

Western Peninsula in the dry districts from Poona southwards. Dalzell only found it near Junnar (Poona district). It is however fairly common on the dry stony hills of the Kuput range etc. in Dharwar, also near Gokak in Belgaum; sometimes on the black-soil plains. Flowers and fruits at different times throughout the year. An acrid succulent plant used in native medicine for poultices to hasten suppuration.

16. V. carnosa, Wall. Cat. 6018; Fl. Br. I. 1, 654; Brandis For. Fl. 101; *V. trifolia*, Linn.; Cooke Fl. Pres. Bomb. 1, 254; *Cissus carnosa,* Roxb.; Dalz. & Gibs. Bomb. Fl. 40; Planch. DC.; Prodr. (Suites au) v, 570. *Odi, ambat-bel, dhawri,* M.; *Khat, Khatumdre, tamanysa*, Guz.

A weak-stemmed, succulent, spreading or climbing plant, densely and shortly pubescent throughout. Leaves rough, trifoliate, on ·75″-1·75″ long petioles; leaflets ovate or obovate, acute or obtuse, crenate-serrate, thick fleshy, 1·5″-3″ by ·75″-1 ·25″, somewhat unequal-sided at the base; petiolules short or O; stipules small, ovate; tendrils leaf-opposed, slender, wiry, usually branched. Cymes

Fig 187. Vitis carnosa, Wall.

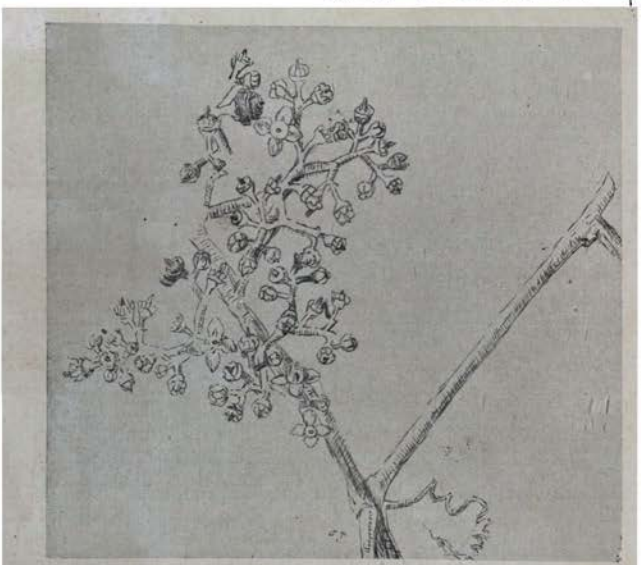


Fig 188. Vitis carnosa, Wall.—*Flowers.*

branched, corymbose long-peduncled; buds globose, 4-lobed at the apex, puberulous Calyx turbinate, truncate. Petals distinct, greenish-white. Stamens white, inserted beneath the disk; anthers white. Disk white, thick; margins lobed. Style conspicuous, conical, purple for half its length and with a minute dark-coloured ring at the apex. Berries black, 2-4-seeded, turbinate, fleshy; seeds ·25″ long,

triangular, with a rounded back along which runs a linear tubercle; front of seed wedge-shaped.

Throughout tropical India from the Punjab to Ceylon and Malacca. On the Konkan and North Kanara ghâts and throughout the Deccan; common in the Dharwar district bordering on North Kanara. Fl. and Fr. May.-Oct. Leaves, roots, and seeds are very acrid and are used in native medicine. Fruit edible, pleasantly acid when quite ripe.

17. V. canarensis, Dalz. in Hook. Kew Jour. Bot. III, 123; Fl. Br. I. 1, 655; *Cissus canarensis,* Planch. DC. Prodr. (Suites au) v, 620.

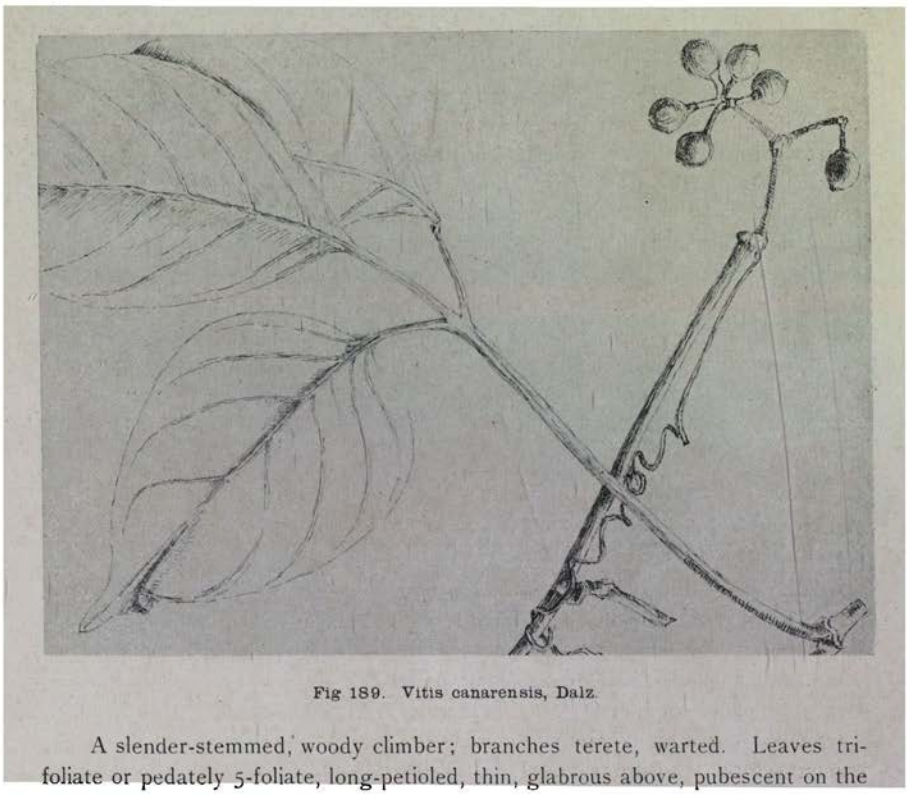


Fig 189. Vitis canarensis, Dalz.

A slender-stemmed, woody climber; branches terete, warted. Leaves trifoliate or pedately 5-foliate, long-petioled, thin, glabrous above, pubescent on the nerves beneath, at length quite glabrous; petioles about 3″ long; leaflets usually purple beneath, ovate or obvate; lateral unequal-sided at the base, acuminate, distantly serrate-dentate; blade 3″-4″ by 1·5″-2·5″; petiolules about 1″ long; stipules lanceolate, very deciduous; tendrils simple or bifurcate, wiry. Flowers small, dicœcious, pedicelled, in short, pubescent, peduncled cymose-umbels, about

as long as the petioles. Calyx small, truncate or slightly lobed. Petals 4, distinct, hooded at apex, ·12″ long. Stigma sessile, 4-lobed. Fruit globose, ·3″ in diameter size of a large currant; pericarp yellow, firm, becoming red and pulpy when the fruit is ripe, 1-seeded; seed globose, 3-4-transversely ridged on either side of the raised dorsal raphe with a crustaceous smooth episperm speckled over with minute white dots; albumen white, cartilaginous, ruminate. The young leaves are usually purple beneath.

A distinct species apparently endemic in the evergreen rain and monsoon-forests of N. Kanara from Ainshi southwards to the Nilkund ghát, locally abundant. Fl. cold season. Fr. ripe Apl.-May. Stems much flattened and covered with broad, thin, longitudinal wings of corky bark.

18. V. araneosa, Laws. Fl. Br. I. 1, 657; Planch. (Suites au) Prodr. v, 405; *Cissus araneosa,* Dalz. & Gibs. Bomb. Fl. 41. *Bendri-bender-wel, ghorwel,* Vern.

A climbing shrub with slender branches and flattened, corky stems; whole plant covered with floccose, deciduous down. Leaves simple or trifoliate, membranous; petioles 1″-2″ long; leaflets cordate, acute; terminal-leaflet elliptic; lateral semi-elliptic, unequal-sided at the base, crenate-serrate, glabrous above, covered with felted down beneath; blade 2″-3″ long; petiolules short. Flowers in compact, umbellate cymes on long, leaf-opposed, cirriferous peduncles. Calyx 5-lobed, small. Petals 5, oblong, obtuse, ·1″ long. Fruit globose, size of a pea, 1-4-seeded; seed ·3″ long, with a depression in the back, puckered round the edges.

Western Peninsula; highest ghâts of the Konkan, about Junnar in the Poona district. Dalz. Pulneys in Southern India, I am unacquainted with this species. Planchon considers it from the description of the seeds to belong to his genus *Ampelocissus.*

19. V. elongata, Wall. Cat. 6016; Fl. Br. I. 1, 658; Cooke Fl. Pres. Bomb. 1, 256. *Cissus elongata,* Roxb. Fl. Ind. 1, 411; Planch. (Suites au) Prodr. v, 621; *Khajulgi,* M.

A large, glabrous climber; branches stout, succulent. Leaves pale-green, purple when young, digitately 3-5-foliate; petioles sulcate, about 3″ long; stipules broad, obtuse, ·25″ long, peltate or cordate at the base; leaflets ovate-lanceolate, acute or acuminate, bristly dentate-serrate, membranous; blade 1·5″-4″ by ·5″-1·25″; petiolules short or O; tendrils simple. Flowers small, 4-merous, in short divaricating corymbose, bracteate cymes; bracts small, caducous. Calyx membranous, cup-shaped, truncate. Petals distinct, hooded at apex. Disk 4-lobed. Ovary ovoid; style short, stout; stigma capitate. Fruit globose, size of small cherry, black, pulpy, 1-seeded; seed pear-shaped, pointed at one end, smooth, ·25″ long.

Sikkim-Himalaya, Bengal, Silhet and the Coromandel; common on the higher Konkan ghâts, Mahableshawar, Sakar-Patar, Khandesh etc. Flowers from the end of April throughout the rainy season. Fruit Nov.-Jan.

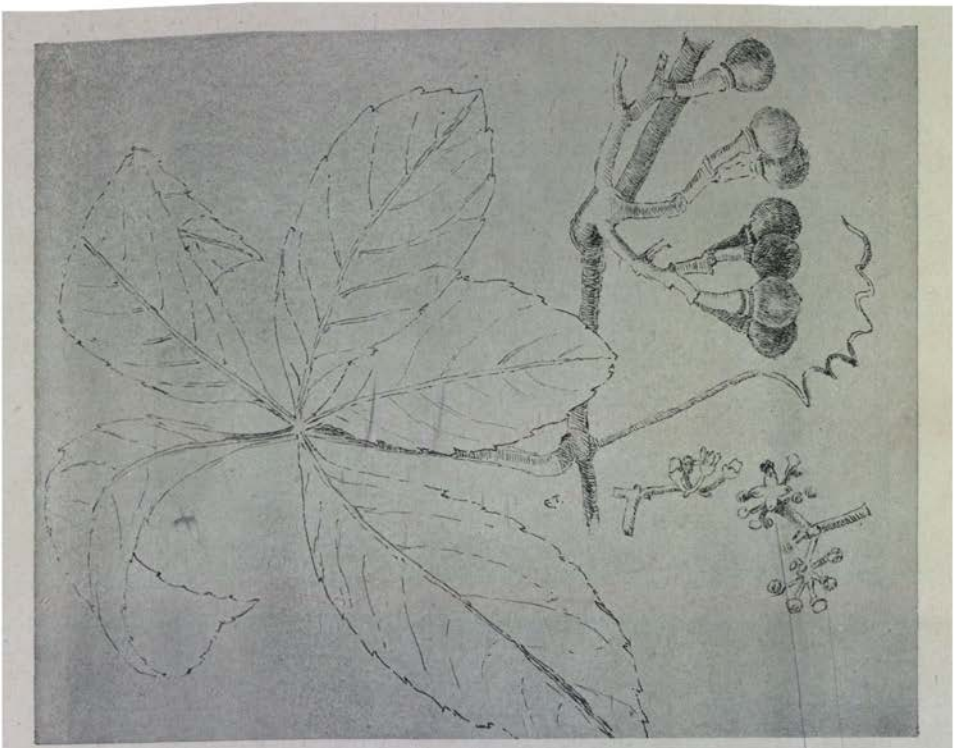


Fig 190. Vitis elongata, Wall.

Var. *littoralis; Vitis sp.* aff. *V. elongata,* Wall.; Talb. Trees. Bomb. 103, differs from the type in its more slender habit, longer, more lanceolate and paler coloured leaflets with very distant serratures. This variety is common in some of the evergreen monsoon-forests along the N. Kanara coast and also occurs in the inland ghát-forests. I have considered it as a variety only of *Vitis elongata*, Wall. Sir G. King did not name the specimens I sent to Calcutta but thought they were different from the typical *V. elongata*, Wall.

20. V. auriculata, Roxb. Fl. I. 1, 412; *Cissus auriculata,* DC. Dalz. & Gibs. Bomb. Fl. 40; Planch. (Suites au) Prodr. v. 564. *Pundi-balli*, K.

A large climber with succulent branches; young parts softly pubescent. Leaves palmately or pedately 3-5-foliate; leaflets 6″-2″ by 4″-1·5″, petioluled, membranous, ovate; acuminate, acutely serrate, glabrous above, pubescent beneath; petioles 2″-6″ long; petiolules ·5″-1·5″ long; stipules broad, falcate;

tendrils 2-3-divided. Flowers 4-merous, in axillary, long-peduncled, divaricate cymes. Calyx membranous, cup-shaped. Petals 4, hooded at the apex, pubescent outside. Style long slender; stigma acute. Fruit globose, size of a cherry, dark purple when ripe; seed large, ·35″ long, ovoid, dorsally flat and rugose or tubercled on either side of the raphe.

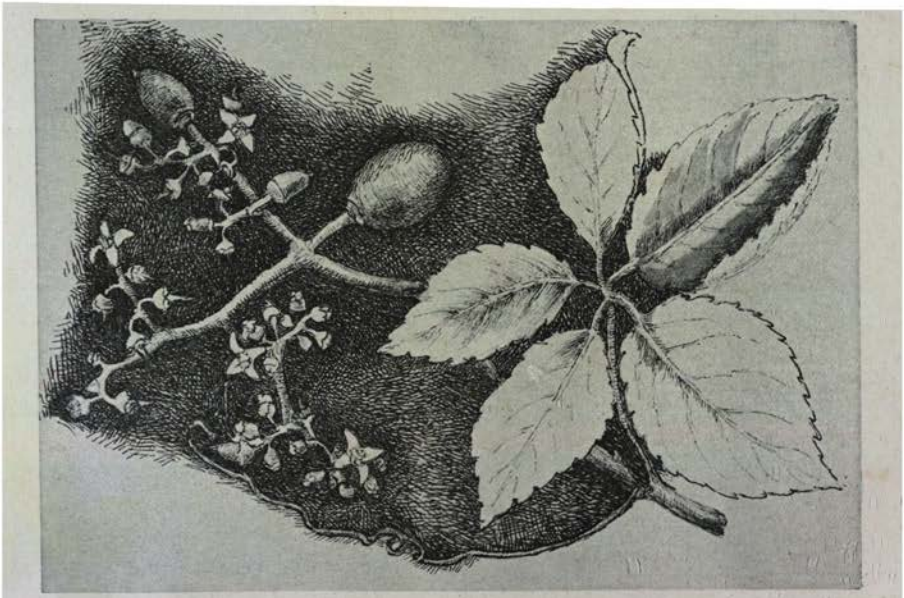


Fig 191. Vitis auriculata, Roxb.

Sikkim-Himalaya, alt. 3-3500′, Chittagong, Bengal and Burma, Western peninsula from the Konkan southwards; common in the dry forests along the Dharwar frontier of the North Kanara and Belgaum Districts and in other parts of the Presidency. Fl. May-June. Fr. Nov. Stems 6″ in diameter at the base, scarcely corky; branches with the corky bark much more developed, very soft and red within. Wood very soft. Leaves fall off in the cold season. Sir G. King writes on a sheet of this *Vitis* sent to the Calcutta herbarium from N. Kanara: "No doubt true *Vitis auriculata*, Roxb. but it is not *Vitis auriculata*, of Wallich, nor is it *Vitis auriculata*, of the Fl. Br. I." Ripe fruit edible and agreeably acid. The young leaves and tendrils are eaten in curries.

21. V. tenuifolia, W. & A. Prodr. 129; Fl. Br. I. 1, 660; Cooke Fl. Pres. Bomb. 1, 257; *Cissus tenuifolia,* Planch. (Suites au) Prodr. v, 563.

A slender, glabrous climber with sulcate, striate branches. Leaves pedately 5-foliate, petioled; petioles 1″-3″ long; the terminal leaflet longer than the lateral and with a longer petiolule; leaflets 4″-1″ by 2″-·6″, obovate or lanceolate, acute, strongly serrate-dentate, membranous; tendrils leaf-opposed, forked. Flowers 4-merous, bisexual, in long-peduncled, divaricate cymes. Calyx funnel-shaped, truncate or obscurely lobed, with membranous margins. Petals 4, ovate, free. Style conical at base, subulate. Fruit size of a pea, turbinate-globose, 1-4 seeded, white; seeds ·2″ long, triangular, dorsally rounded and muricate, sharply ridged on the face.

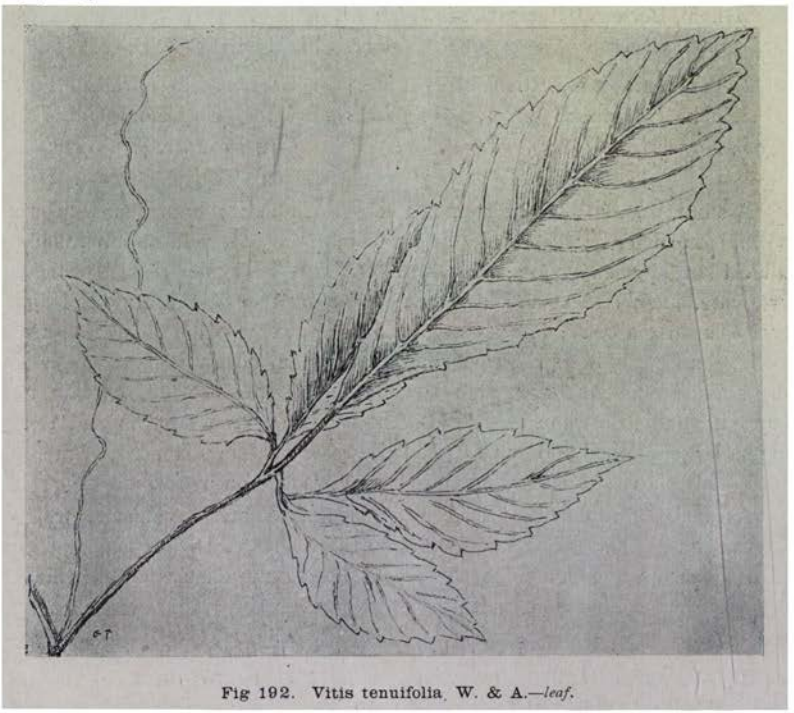


Fig 192. Vitis tenuifolia W. & A.—*leaf.*

Western peninsula from the Konkan southwards. In the rain-forests of the North Kanara district from Ainshi southwards. A distinct species. Sir G. King thinks that this is only a glabrous form of *V. japonica,* Thunb. (*V. mollis,* Wall.)

22. V. pedata, Vahl. in Herb. Madr. ex Wall. Cat. 6027; Fl. Br. I. 1, 661; Cooke Fl. Pres. Bomb. 1, 257; *Cissus pedata,* Dalz. & Gibs. Bomb. Fl. 40; Grah. Cat. Bomb. Pl. 33; *Cayratia pedata.* (Lamk.) Planch. (Suites au) Prodr. v, 568. *Gorpad-wel,* M.; *Mediya-wel,* Sind.

A scandent, usually softly pubescent or hirsute climber with long slender, forked tendrils. Leaves 7-11-pedately-foliate; petioles 2″-4″ long; stipules cordate, acute; leaflets unequal, 4″-8″ by 1·5″-3″, oblong-lanceolate; lateral oblique at the base, acuminate, serrate, pubescent on both sides. Flowers white, bisexual, in axillary, short-peduncled, lax, spreading cymes. Calyx shallow 4-lobed. Petals usually 4, hooded and cohering at the apex. Disk cup-shaped, exceeding the ovary. Style subulate. Fruit globose, ·5″ in diameter, 2-4-seeded, cream-coloured when ripe; seeds sub-globose, smooth, dorsally convex with a central pit on the flat ventral face closed by a thin membrane.

Bengal, Burma, Assam, Khasia, Western peninsula from the Konkan southwards, Sind, Ceylon. A large weak climber. Fl. H. S. Fr. R. S.

23. V. lanceolaria, Roxb. Fl. Ind. 412; Fl. Br. I. 1, 660; Brandis For. Fl. 101; Cooke Fl. Pres. Bomb. 1, 258; *Cissus muricata,* Dalz. and Gibs. Bomb. Fl. 40.; *Tetrastigma lanceolarium,* Planch. (Suites au) Prodr. v, 423. *Kajolitsayel,* M.

A stout, woody climber; stems 2″-3″ in diameter; branches with rough, brown, lenticellate bark. Leaves 3 or 5-pedately-foliate, reddish-puberulous and pellucid-dotted when young; petioles 1″-3″ long; leaflets petioluled, thin when dry, ovate, acuminate or lanceolate-acute, 3″-5″ by 1″-2·5″, distantly and sharply serrate, soon glabrous; lateral-nerves about 7 pairs; stipules ovate; tendrils woody, simple. Flowers dicœcious, in spreading, cymose panicles; male-cymes longer and female shorter than the petioles. Bracts ovate, cordate, acute. Calyx turbinate; tip truncate. Petals yellowish, free, spreading, hooded at apex. Stigma large, 4-lobed. Berry 2-4-seeded, globose, ·4″ in diameter, white when ripe; seeds obtusely angular, smooth, deeply grooved on back.

Assam, Pegu and the Eastern peninsula; Western peninsula from the Konkan southwards to Ceylon. Found on the N. Kanara ghâts in rain-forests but not nearly so common as the following closely allied species which has hitherto been confounded with it. Fl. Nov.-Dec. Fr. May. Branches fluted, covered with hard, small, raised lenticels.

24. V. reticulata, Thwaites. Enum. 63, *(Cissus);* Trimen Flora of Ceylon 1, 294; Fl. Br. I. 1, 655; *V. lanceolaria,* Roxb.; Talb. Trees Bomb. 104; *Cissus muricata,* Dalz. & Gibs. Bomb. Fl. 40; *C. retivenia,* Planch. Mon. Phan. v, 576.

A large climbing shrub; branches covered with hard, raised whitish lenticels; tendrils long, simple or forked, wiry. Leaves petioled, 3 or 5-pedately-foliate; petioles 2″-3″ long; leaflets 6″-3″ by 3″-1·50″, coriaceous, ovate, shortly acuminate or acute, apiculate, irregularly distantly serrate; serratures with a callous tip; venation reticulate, conspicuous beneath; lateral-nerves about 10 pairs. Flowers 4-merous, dicœcious, in short panicled, rufous-tomentose cymes; buds

angled, short, constricted in the middle and 4-lobed at apex. Calyx very short, truncate, nearly obsolete in the female flower. Petals hooded, free. Style stout; conical, glabrous, constricted at the base above the ovary; stigma 4-lobed. Staminodes slender. Fruit globose ·75″ in diameter, 2-4-seeded, white when ripe; seeds ovoid ·3″ long, pointed, with a broad ventral furrow and a narrow one on either side of the dorsal raphe, transversely rugose.

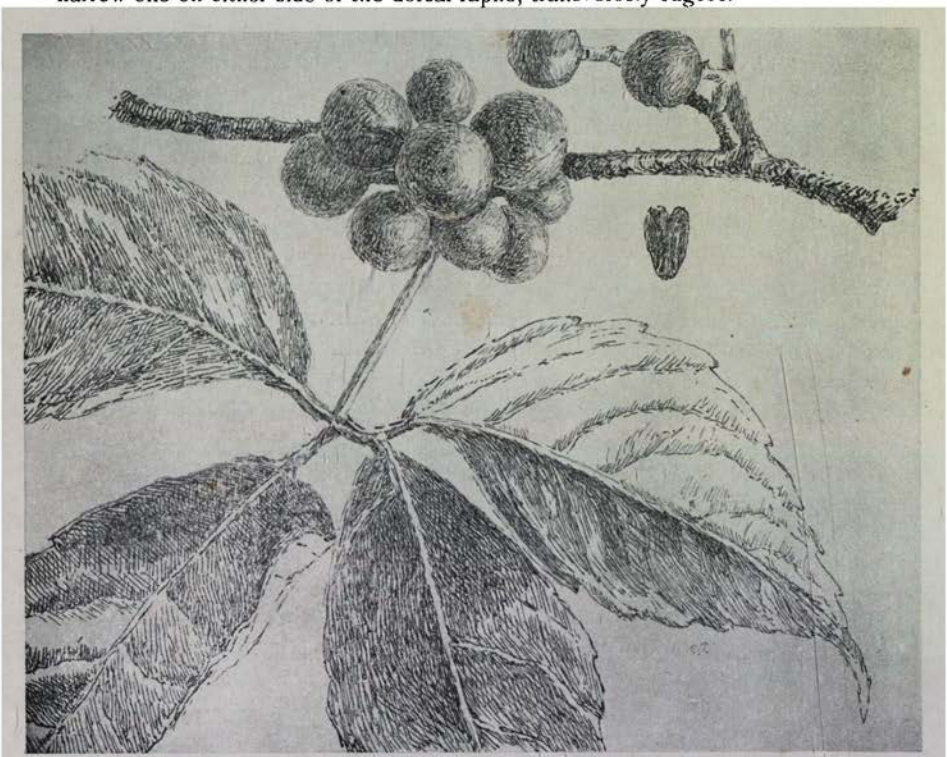


Fig 193. Vitis reticulata, Thw.

Endemic in Ceylon and the Western peninsula; common on the ghâts of N. Kanara in rain-forest. This species is closely allied to *V. lanceolaria*, Roxb. with which the Bombay plant has been usually confounded. Sir G. King has however remarked on specimens from N. Kanara "This is *Vitis reticulata*, Thw. and certainly quite different from *V. lanceolaria*, Roxb." It will be seen from the foregoing descriptions that both this and *V. canarensis*, Dalz. included by Planchon in his genera *Cissus* and *Cayratia* respectively, belong properly to his genus *Tetrastigma*.

2. LEEA, LINN.

Small trees, erect shrubs or herbs; branches usually green, herbaceous, striate or sulcate. Leaves alternate, usually very large, simple or compound; petioles dilated at the base into a sheath. Inflorescence leaf-opposed, corymbosely cymose. No tendrils. Flowers small, red, white or greenish-yellow. Calyx 5-toothed. Petals 5, united at the base with the staminal-tube, revolute. Stamens 5, united at the base into a 5-lobed tube; filaments inserted between the lobes on the outside, inflexed; anthers free and exserted or connate and included in the tube. Ovary on disk, 3-6-celled; style short; stigma enlarged; ovules 1 in each cell. Berry 3-6-celled, succulent, flattened at the top. Seeds erect; embryo small; albumen cartilaginous.

Leaves simple, very large.
Herbaceous shrub. ... ... 1. L. macrophylla.
Leaves pinnate, shrubs.
Stems petioles, etc., with 6-8 crisped wings. ... 2. L. crispa.
Stems without crisped wings. ... ... 3. L. aspera.
Leaves bi-tripinnate.
A glabrous, small tree. ... ... 4. L. sambucina.
A pubescent, bristly shrub. ... ... 5. L. Talboti.

1. L. macrophylla, Roxb. Fl. Ind. 1, 653; Fl. Br. I. 1, 664; Brandis. For. Fl. 102; Dalz. and Gibs. Bomb. Fl. 41; Cooke Fl. Pres. Bomb. 1, 259; Wight. Ic. t. 1154; Grah. Cat. 247. *Dinda,* M.

A large, erect, flexuose-stemmed, herbaceous shrub, springing from a tuberous, red-coloured, perennial root. Leaves simple, very large, 6″-24″ by 4″-18″, ovate or suborbicular, cordate, acute or acuminate, irregularly dentate, entire or sub-lobate, covered with very minute, white, scaly dots and glabrous above, pale and shortly tomentose beneath; midrib sulcate; main lateral-nerves 10-12 pairs, opposite; petioles thick, hollow, sulcate, 4″ to 6″ long. Flowers white, in long-peduncled, corymbose, spreading cymes, often 12″ long; buds 5-ribbed. Calyx shallow, cup-shaped, 5-lobed; lobes broadly triangular with a callous tip and scarious margins. Petals oblong. Staminal-tube divided to near the base; lobes entire or emarginate; filaments attached to the column by short, slender threads, thickened above; anthers laterally connate; connective dark-coloured. Fruit depressed-globose, ·25″-·35″ across, smooth, succulent, black, 4-6-lobed when dry, 4-6-seeded; seeds smooth, pointed, dorsally rounded and ventrally obtusely angled; albumen hard, ruminate.

Throughout the hotter parts of India from the Himalaya (Kumaon) to Bengal, Assam and Tenasserim, Western peninsular forests of North Kanara and

the Konkan; common in rain-forest near Yellapur, North Kanara. Fl. and Fr. R. S.

2. L. crispa, Willd. Sp. Pl. 1, 1177; Fl. Br. I. 1, 665; Cooke Fl. Pres. Bomb. 1, 259.

Sikkim-Himalaya and the Khasia mountains, 1-400′ alt., Assam, Chittagong and the Western peninsula. *L. aspera,* Wall. the next species, often with narrowly winged petioles and peduncles has been mistaken for *L. crispa*, which is very doubtfully indigenous in the Bombay Presidency.

3. L. aspera, Wall. in Roxb. Fl. Ind. 2, 468; Fl. Br. I. 1, 665; Brandis For. Fl. 102; Cooke Fl. Pres. Bomb. 1, 260.

An erect, branched shrub, 6′-10′ high; stems terete not 6-8-crisply-winged like those of *L. crispa*, Willd. but branches, petioles and peduncles often have opposite narrow wings. Leaves usually simply pinnate; leaflets elliptic, acuminate, 8″-3″ by 3″-1″ coriaceous, cordate or rounded at the base, irregularly, acutely serrate, glabrous or hispidulous above, rufous or grey-pubescent, principally on the nerves and veins beneath; nerves 12 to 18 pairs, parallel, prominent Flowers greenish-white in peduncled, axillary divaricate, pubescent cymes, shorter than the leaves; bracteoles linear, spathulate, subpersistent. Calyx with 5, broad shallow lobes. Petals 5. Staminal-tube divided to near the middle; lobes emarginate, tomentose outside; filaments broad, inserted below the middle of the column on the outside; anthers not united in bud, situated between the lobes of the column; connective broad. Style short, subulate, scarcely thickened at the apex. Berry depressed-globose, 4-6-lobed, size of a large pea, smooth, black; seeds ·15″ long, smooth, dorsally rounded with a longitudinal sinus, wedge-shaped ventrally; albumen ruminate.

Western Tropical Himalaya from Jammu to Nepal, ascending to 6,000′; Oudh; Western peninsula from the Konkan southwards; throughout North Kanara, very common in moist moonsoon-forests; not noted by either Graham or Dalzell in their Bombay floras.

4. L. sambucina, Willd. Sp. Pl. I. 1, 177; Fl. Br. I. 1, 666; Brandis For. Fl. 102; Cooke Fl. Pres. Bomb. 1, 260; *L. Staphylea,* Roxb.; Dalz. & Gibs. Bomb. Fl. 41. *Kurkunnie,* Vern.; *Dino,* Kon.; *Rai-dinda,* M.; *Nurche, totmudki. midichi, jini*, K.

A large shrub or small tree with long, glabrous, straight, sulcate branches, Leaves bi-rarely tripinnate, 2′-3′ long; leaflets 2″-10″ by ·75″-4·5″, oblong or narrow-lanceolate, acute or acuminate, deeply irregularly serrate, cuneate or acute at base, drying black, glabrous, shining above; lateral-nerves 7-12 pairs, strong beneath, arched upwards, Flowers greenish-white; buds ribbed when dry, in large compound, corymbose cymes; bracts minute, caducous. Calyx 5-divided;

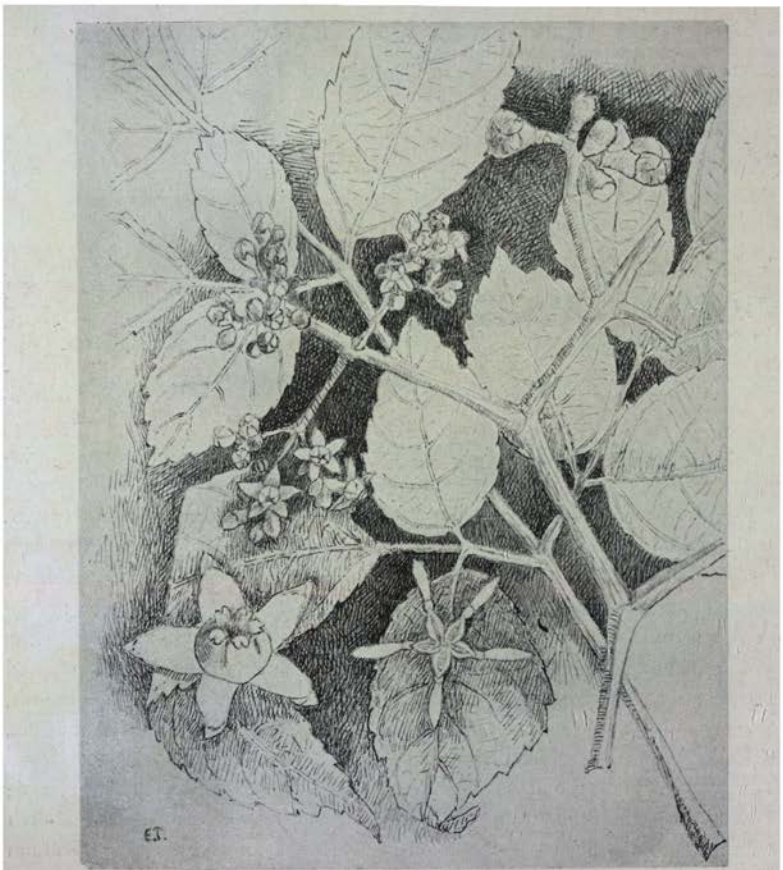


Fig 194. Leea sambucina, Willd.

lobes triangular, acute, puberulous outside. Petals spreading, slightly reflexed, hooded at apex. Staminal-tube white, urceolate, 5-toothed; teeth notched; tube outside furnished with 5 sinuses in each of which lies a filament; anthers united within the tube. Fruit depressed-globose, ·3″ in diameter, often 2-6-lobed and seeded, shining, purple-black; seeds, small, ·12″ in diameter, planoconvex.

Hotter parts of India from the Himalaya (Kumaon) to Burma and southwards to Ceylon and Malacca. Throughout the presidency, common in the moist rain and monsoon-forests of North Kanara and Konkan. Fl. and Fr. throughout the year.

Stems 30′ high and 4″ in diameter. Bark brown, smooth outside, inside with long, soft, reddish anastomosing or free fibres; young branches green. Wood pink, lustrous. Annual-rings distinct. Medullary rays broad and fine. Pores small, numerous. Weighs about 40 lbs. to the cub. ft.

In the heavy rainfall, of the rain-forests of N. Kanara this species often develops short aerial roots abundantly from the branches.

5. L. Talboti, King Mss. in Herb. Hort. Calcutt. sp. nov.

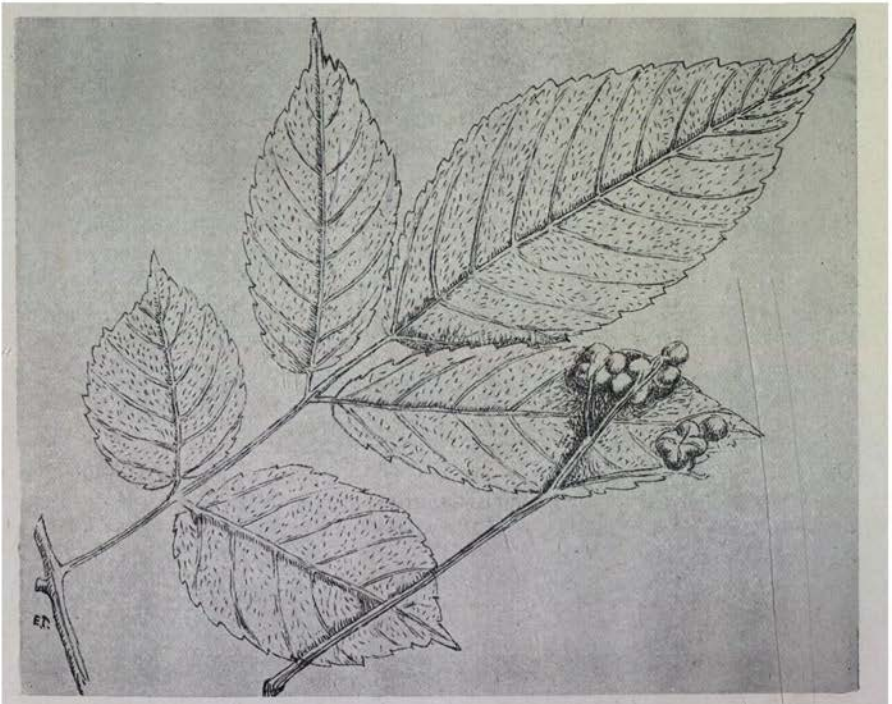


Fig 195. Leea Talboti, King.

An erect, herbaceous shrub, 3″-6″ high; young stems and branches red-dotted, sulcate. Leaves large, bipinnate; petioles about 4″ long; leaflets ovate-lanceolate acute or acuminate, 5″-2″ by 2″-1·5″, adpressed white-hairy above, pale and pubescent beneath, irregularly serrate; (margins of the leaflet more or less parallel about the middle); lateral-nerves about 10 pairs; petiolules of lateral leaflets ·25″-·5 long. Flowers in leaf-opposed, corymbose cymes; buds ribbed; peduncles sulcate, 3″-6″ long. Calyx 5-lobed; lobes broadly triangular with membranous margins.

Petals 5, hooded at the apex. Staminal-tube very deeply lobed; lobes narrow, bifid at the tip which is white-scaly on the outside; filaments flat; anthers connate and enclosed in the tube; connective broad, red. Fruit depressed-globose, 4-6-lobed, ·4″ in diameter, black, succulent; seeds smooth, subglobose, ·1″ in diameter, dorsally ridged and ventrally broadly angular.

Common in the undergrowth of the evergreen rain-forests of N. Kanara and South Konkan, often associated with *L. aspera*, Wall; closely allied to *L. setuligera*, C. B. C. which is however a much smaller plant with a perfectly glabrous corymb.

6. L. latifolia, Wall. Cat, 6821; C. B. Clarke in Trim. Jour. Bot. (1881), 138; *L. coriacea*, Laws.; *L. cinerea*, Laws., is a pinnate-leafed shrub, doubtfully indigenous in the Bombay Presidency; represented in Kew by one specimen marked "Konkan, Stocks."

L. robusta, Roxb. Hort. Beng. 18; C. B. Clarke in Trim. Jour. Bot. (1881), 64; *L. diffusa*, Laws. Fl. Br. I. A small shrub with rusty-pubescent branches, pinnate to tripinnate leaves, irregularly serrate leaflets 3″-9″ by 1″-3·75″, pubescent above and sparsely strigose on the nerves beneath. Flowers in compound racemes; bracts caducous. Lobes of staminal-tube rounded, entire at apex. Berry ·25″ in diameter, depressed-globular, black when ripe; seeds 4-6. I have not found this species.

Konkan at Mira Donger near Pen, Kolaba district. Dalzell.

L. æquata, Linn. Mantiss. 1 (1767) 124. C. B. Clarke in Trim. Jour. Bot. (1881); *L. hirta*, Roxb.; Laws. Fl. Br. I. 1, 668, is not, I think, found within the limits of the Bombay presidency and was erroneously included in the 1894 edition of my List of Trees, Shrubs etc.

Order XXXIII.—SAPINDACEÆ.

Trees or shrubs, rarely herbs. Leaves alternate or opposite, simple or pinnate; stipules caducous or O. Flowers small, polygamo-dicœcious, often irregular or unsymmetrical. Sepals 4-5, free or united. Petals 4-5, free, often squamate at the base. Disk complete or 1-sided, rarely deficient in the male flowers. Stamens free, 5-10, inserted inside the disk at the base of the ovary, rarely on the disk or unilateral; anthers 2-celled; filaments often pubescent. Ovary centric or excentric; style simple or divided; stigma usually simple; ovules 1 or 2 in each cell on axile placentas. Fruit capsular or indehiscent. Seeds arillate or naked, albuminous or exalbuminous; embryo thick, sometimes plicate or spirally convolute.

Flowers regular or irregular. Stamens inserted inside the disk. Seeds exalbuminous. *(Sapindeæ).*
- Flowers irregular. Disk unilateral. Leaves pinnate or trifoliate.
  - Leaves pinnate. Flowers not minute.
    - Fruit indehiscent, not lobed ... ... 1. Hemigyrosa.
    - Fruit indehiscent, 3-lobed to the base ... 2. Erioglossum.
  - Leaves trifoliate. Flowers very minute ... 3. Allophyllus.
- Flowers regular. Disk annular.
  - Petals O. Fruit syncarpous, 1-seeded ... 4. Schleichera.
  - Petals usually present. Fruit of 1-3-cocci.
    - Sepals imbricated ... ... 5. Sapindus.
    - Calyx-divisions valvate.
      - Fruit tubercled, indehiscent ... ... 6. Nephelium.
      - Fruit an orange-coloured, inflated capsule. 7. Harpullia.

Flowers regular. Stamens inserted outside the disk. Seeds exalbuminous. Leaves alternate. *(Dodoneæ.)*
- Leaves simple. Fruit a winged capsule ... 8. Dodonæa.

Flowers regular. Stamens inserted outside the disk. Seeds albuminous. Leaves opposite. *(Staphyleæ).*
- Leaves pinnate. Fruit globose, indehiscent ... 9. Turpinia.

1. HEMIGYROSA, BLUME.

Trees. Leaves pale-coloured, coriaceous, abruptly-pinnate; stipules O. Flowers irregular, in axillary panicles, polygamo-monœcious. Sepals 5, erect,

concave, the two outer smaller. Petals 4-5, with a scale at base of the claw. Disk unilateral, cushion-shaped. Stamens 6-8; in male flowers 6-10; filaments pilose, somewhat unilateral; anthers not or scarcely exserted. Ovary excentric, trigonous, 3-celled; stigma short, trigonous, blunt; ovule solitary. Fruit cartilaginous or woody, 3-celled; cells hairy within, 1-3-seeded; seeds exalbuminous and exarillate; cotyledons fleshy, equal.

H. canescens, Thwaites Enum. 56, 408; Fl. Br. I. 1, 671; Bedd. Fl. Sylv. t. 151; *Cupania canescens,* Pers.; Dalz. & Gibs. Bomb. Fl. 35. *Kurpa, lakhandi,* M.; *Kurpah, mooltaga,* K.

Fig 196. Hemigyrosa canescens. Thw.

A moderate-sized tree. Leaves alternate, 6″-10″ long; petioles 3″ long; leaflets 1-4, usually 2-3 pairs; terminal-pair opposite, others opposite, subopposite or the leaflets alternate, oblong or lanceolate, obtuse or acute, coriaceous, shining; lateral-nerves strong and prominent beneath; blade 8″-3″ by 2·5″-1″; petiolules rugulose, ·25″ long. Racemes simple or panicled, as long as or shorter than the leaves, axillary, minutely tomentose; bracteoles subulate. Flowers

fascicled, white, ·25″ across. Sepals unequal; the 2-outer ovate, orbicular, ciliate; the 3 inner larger, orbicular, concave with ciliate margins. Petals usually 4, oblong-spathulate, short-clawed, each with a bifid, hairy, basal-scale, half as long as the petal or the 5th when present scaleless. Stamens rather longer than the petals, unilateral on opposite side from disk. Ovary excentric, tomentose. Fruit ovoid, ·5″-1″ in diameter, obtusely triangular, yellow-tomentose, often 1-seeded; epicarp cartilaginous; mesocarp pulpy.

Western peninsula from the Konkan southwards, Tenasserim, Burma, Eastern side of the Madras Presidency and low country of Ceylon; scattered throughout the N. Kanara and Konkan evergreen monsoon-forests, common on laterite on the higher ghâts of the Supa sub-division of North Kanara.

A fairly large and straight tree in North Kanara. Fl. Feb. May. Fruit ripe in June and July. Bark ash-coloured, slightly scabrous. Wood reddish-white or grey, hard, smooth with numerous, narrow, wavy, concentric, anastomosing, closely set bands of light-coloured tissue; no distinct heartwood. Pores medium-sized, uniformly distributed. Medullary rays very fine, equally distributed within or between the bands. Weighs 59 lbs. to the cub. ft.

2. ERIOGLOSSUM, Blume.

Trees or shrubs. Leaves alternate, pinnate, exstipulate; leaflets opposite, entire. Flowers in terminal, erect panicles, polygamo-dicœcious. Sepals 5, unequal, imbricated; 2 outer smaller. Petals 4, unequal, clawed; scale hairy, hooded, with an appendage at the tip. Disk 1-sided, lobed Stamens 8, unequal; filaments hairy. Ovary stipitate, obcordate, 3-lobed, 3-celled; style slender; stigma obscurely 3-lobed; cells 1-ovuled. Fruit lobed to the base, indehiscent. Seeds oblong, exarillate, exalbuminous; embryo straight; cotyledons thick.

E. edule, Bl. Bijdr. 299; Fl. Br. I. 1, 672; *E. rubiginosum*, Brandis For. Fl. 108; *Sapindus rubiginosa*, Roxb. Fl. Ind. 2, 282; Grah. Cat. Bo. Pl. 29; Dalz. & Gibs. Bomb. Fl. Suppl. 14; Bedd. Fl. Sylv. 73.

A large timber tree. Leaves 12″ to 14″ long, with the petiole ending in a tomentose bristle; leaflets 4-6, in opposite or subopposite pairs, usually oblique, obtuse, glabrous above, pubescent beneath; blade 4″-6″ by 1″-2″; petiolules ·25″ long. Flowers crowded in ferruginous, pubescent, simple or panicled, axillary racemes. Fruit of 1-3, oblong cocci, ·25″ in diameter.

Sikkim Himalaya, Assam, Eastern peninsula, Burma to Penang, Malacca and the Andamans, planted near Bombay, very doubtfully indigenous on the Western Coast. Dalzell says, "in the woods of Girgaum, but certainly planted".

Wood strong, durable, with chocolate-coloured heart-wood.

3. ALLOPHYLUS, Linn.

Small trees or climbing shrubs. Leaves 1-3-foliate ; leaflets entire or serrate; stipules O. Flowers polygamo-dicœcious, small, white, in simple or paniculate spikes. Sepals 4, in opposite pairs, membranous, imbricate. Petals 4, with a shaggy scale above the claw. Stamens 8, inserted on the receptacle inside the disk. Ovary usually 2-lobed and 2-celled Disk 1-sided, usually with 4 glands opposite the petals, rarely obsolete. Fruit small, red, indehiscent, shining. Seeds usually with a short fleshy arillus; embryo curved; cotyledons plicate.

A. Cobbe, Bl. Rumph. III, 131 ; Fl. Br. I. 1, 673; Cooke Fl. Pres. Bomb. 1, 265; Gamble Ind. Timb. 193; *Cardiospermum Schmidelia* and *C. villosa,* Dalz. & Gibs. Bomb. Fl. 34; *Schmidelia Cobbe,* Grah. Cat. Bomb. Pl. 29; Bedd. Fl. Sylv. 72. *Titwi,* M.; *Kasa-bally, murèle-bhendy,* K.

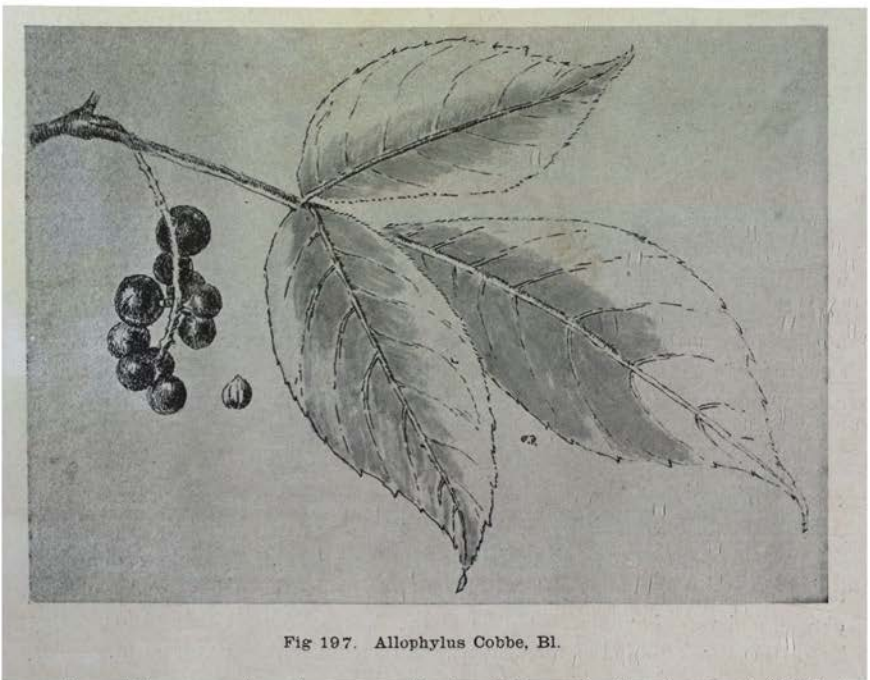


Fig 197. Allophylus Cobbe, Bl.

A small tree, usually a large scandent, ecirrhose shrub. Leaves trifoliate, brown-tomentose; leaflets obovate, ovate or lanceolate, acuminate, hairy or glabrous, sub-coriaceous, entire, dentate or serrate; blade very variable in size 2″-8″ by 1″-3″; petioles 2″-5″ long; lateral petiolules very short; terminal one up to ·75″ long. Inflorescence 3″-9″ long; flowers in axillary, branched or simple

racemes, yellowish-white, clustered along the rachis, very small; pedicels short, slender. Petals cuneate, notched. Filaments villous at the base. Ovary 2-lobed, pubescent, Fruit ·25″ across, red, shining, globose; seed usually solitary, bony, ridged at one end.

Eastern Bengal, Assam, Burma, Eastern and Western Peninsulas and the Andamans, common throughout the Konkan and North Kanara in monsoon-forests and along the banks of rivers and nalas. Fl. April-Aug. Fr. (Oct. at Mahableshwar) rainy and cold seasons. A gregarious and exceedingly variable plant; no less than 30 synonyms being quoted in the Fl. Br. I. by Hiern, who divides the species roughly into 8 varieties. The common W. Peninsular form he calls *var. Rheedii*, it differs principally from the others by the branched inflorescence.

Scandent. Trunk 6″-8″ in diamater, irregular, fluted. Bark dark-grey, thin, scaly, sometimes with corky lenticels; inner-bark thin, reddish, fibrous. Green-cells developed. Wood grey, soft. Pores moderate-sized numerous. Medullary rays fine, short, crossed by white, parallel wavy, equidistant, concentric lines. Weighs about 40 lbs. to the cub. ft. Ripe fruit said to be edible. Roots used in native medicine for rheumatic pains.

4. SCHLEICHERA, Willd.

Trees. Leaves alternate, extipulate, pinnate. Flowers regular, fascicled, polygamo-dicœcious. Calyx 4-8-cleft. Petals O. Stamens 6-8, on centre of the complete, glabrous, flat, wavy disk. Ovary ovoid, 3-4-celled, narrowed into a rigid style; stigma 3-4-cleft. Fruit dry, indehiscent, 1-3-celled, spinous or smooth. Seeds arillate; embryo conduplicate; cotyledons unequal and closely coherent.

S. trijuga, Willd. Sp. Pl. IV, 1096; Dalz. & Gibs. Bomb. Fl. 35; Bedd. Fl. Sylv. t. 119; Cooke Fl. Pres. Bomb. 1, 266; Gamble Ind. Timb. 194; Brandis For. Fl. 105. *Ceylon Oak; Kusumb, koon, kohan,* M.; *Kuhumb,* Bhil, *Sagada,* K.

A large, deciduous tree. Leaves 8″-10″ long; petioles 2″ long, pubescent or glabrous; leaflets 2-3 pairs, membranous when young, coriaceous when old, sessile, ovate-oblong, entire, acuminate, glabrescent or hairy on the nerves beneath; lowest pair 1″-3″ by ·5″-1·5″; terminal pair 6″ by 2·5″. Flowers fascicled, yellow, on short, slender pedicels; male and hermaphrodite on separate trees; inflorescence in interrupted or branched racemes. Fruit ellipsoid, spinous or smooth, ·75″ by ·5″; seeds 1-2, enclosed almost entirely in an edible, pulpy arillus; cotyledons very oily.

From the N. W. Himalaya to C. & S. India and Ceylon, cultivated in gardens in Sind; common throughout the Bombay Presidency in both dry and moist mixed forests; ascends to over 3500′ in the Khandesh Satpudas (Akrani).

A large tree with a deeply furrowed trunk, 60-70′ high by 2′ in diameter. Bark ·5″ thick; greyish, with exfoliating scales. Wood red, heavy, close-grained, hard, strong and durable; seasons well. Pores scanty, small, in short radial lines or groups. Medullary rays very fine and numerous. Weighs 60-70 lbs. to the cub. ft. Much in demand for sugarcane mills, also for agricultural implements, carts, etc; yields excellent firewood and charcoal. The young foliage, is conspicuous when it appears in March, purple at first and resembling that of *Quercus*

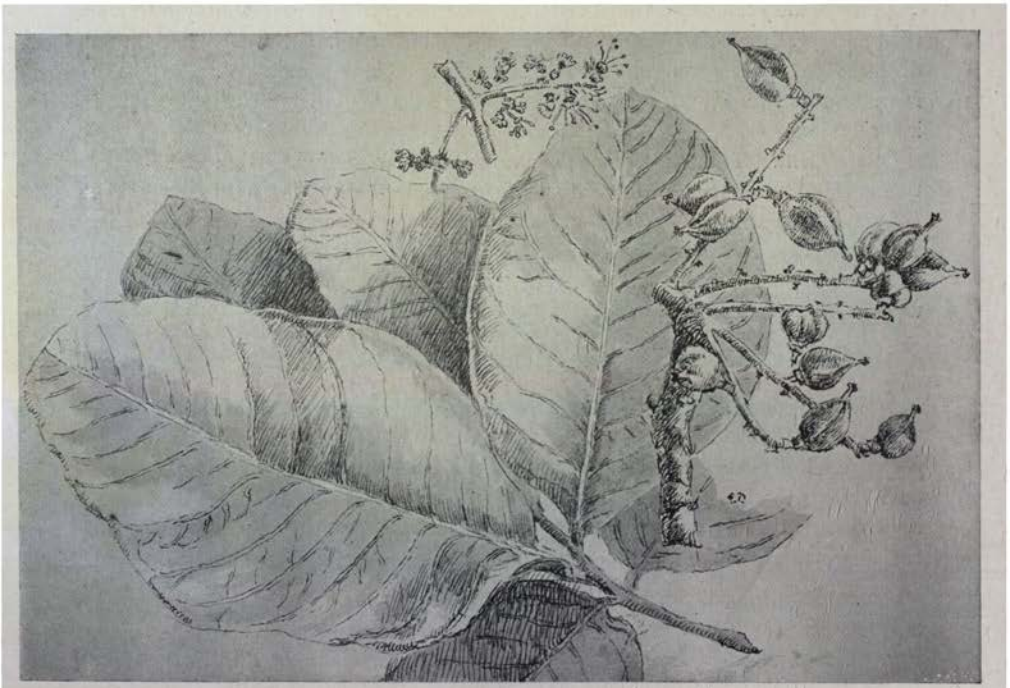


Fig 198. Schleichera trijuga, Willd.

Robur, but it soon changes to a light and subsequently to a dark-green colour. The flowers appear along with the fresh leaves. Oil said to be the basis of the well known "Macassar" hair-oil is extracted from the seeds which ripen during the hot season or at the beginning of the rains. The bark contains about 9 per cent. of tannin.

5. SAPINDUS, Linn.

Trees or shrubs. Leaves alternate, exstipulate, usually paripinnate. Inflorescence terminal or axillary. Flowers regular, polygamous. Calyx of 5, some-

what unequal sepals connate at the base, much imbricate in bud, deciduous. Petals 4-5, nearly equal, alternate with the sepals; claws thickened, with or without scales on the inside. Disk complete, annular, fleshy, glabrous and lobed. Stamens 8-10, inserted within the disk. Ovary entire or lobed, 2-4-celled; style terminal; stigma 2-4-lobed; ovule solitary in each cell. Fruit of 1-3, indehiscent cocci, sometimes rusty-tomentose. Seeds usually globose with a crustaceous or membranous testa; cotyledons thick; radicle short.

S. laurifolius, Vahl; Dalz. & Gibs. Bomb. Fl. 34; Bedd. Fl. Sylv. 73; Brandis For. Fl. 106, l. c. 107; *S. trifoliatus*, Linn. Sp. Pl. ed. 1, 367; Fl. Br. I. 1, 682; *S. emarginata*, Roxb.; Bedd. Fl. Sylv. t. 154; Dalz. & Gibs. Bomb. Fl. 35. *Aratala, antal, kantalkai-mara,* K.; *Rita, ardal, pitha,* M. *Soapnut Tree* of Southern India.

Fig 199. Sapindus trifoliatus, Linn.

A large tree. Leaves 5″-12″ long; leaflets 2-3 pairs, those of terminal pair longest, elliptic, oblong- acuminate, glabrous or pubescent beneath; main lateral-nerves 8-12 on either side of the midrib, with a few shorter intermediate ones; blade 1 ·5″-8″ by 1″-4″; petiolules short. Flowers in terminal, pubescent panicles. Sepals 5, obtuse, elliptic. Petals 4-5, sometimes with a pilose, ciliate scale more or less attached to the claw and inner surface of the petal, this is however usually absent and the petal is simply woolly on the inner face. Stamens 8; anthers apiculate. Disk concave with a raised fleshy hirsute edge. Ovary 3-lobed, ferruginous-tomentose. Fruit fleshy, consisting of 2-3, indehiscent carpels, ·5″-·75″ long, rusty-tomentose, at length glabrous, saponaceous. Var. *emarginatus*, which is considered by many authors to be a separate species, differs in the generally smaller, obtuse or emarginate leaflets, glabrous or densely tomentose beneath and larger flowers with the petals exceeding the sepals. I have not detected in my specimens of this variety the petal-scales referred to in the Fl. Br. I.

Distributed along the Western ghâts from the Konkan southwards in evergreen monsoon-forests; Southern India and Ceylon but nowhere common, often planted. The variety *emarginatus*, is usually confined to the dry, deciduous forests of the Deccan and Carnatic, Burmah and Ceylon; it is also frequently planted near villages. Fl. Oct.-Dec. Fr. Feb-Apl.

A large, evergreen tree with a much branched, spreading crown. Bark grey, shining, with rough scales. Wood hard, yellow, heavy, not durable, splits and cracks on exposure. Pores moderate-sized, joined by wavy bands of light tissue. Medullary rays numerous, very fine, indistinct. Weighs about 56 lbs. to the cub. ft. Sometimes but rarely used for building purposes, carts, &c. The fruit is largely employed in Southern India as a substitue for soap to which it is preferred for washing silk and flannel. The root, bark and fruit are used in native medicine. A semi-solid oil is extracted from the seed.

6. NEPHELIUM, Linn.

Trees or shrubs. Leaves pinnate, alternate, exstipulate, rarely simple; leaflets entire. Flowers regular, polygamous, in terminal panicles. Calyx 4-8-lobed, usually cup-shaped, subvalvate or slightly imbricating in bud. Petals 0 or 4-6, villous or with 2 scales. Stamens 5-10, inserted within the fleshy, glabrous or pubescent, lobed disk; filaments filiform, glabrous or hairy. Ovary short, 2-3-lobed, often verrucose or tubercled; lobes 1-celled, 1-ovuled; stigma subsessile, 3-4-lobed. Fruit 1-4-lobed, indehiscent, globose or oblong, echinate, tubercled or smooth. Seeds globose, enclosed in a pulpy arillus; cotyledons plano-convex.

N. Longana, Camb. in Mem. Mus. Par. XVIII, 30; Fl. Br. I. 1, 689; Dalz. & Gibs. Bomb. Fl. 35; Cooke Fl. Pres. Bomb. 1, 267; Gamble Ind. Timb. 197;

Euphoria Longana, Lamk.; Bedd. Fl. Sylv. t. 156. *Wumb* M.; *Kanakindali*, K.; *Longan*, Chinese.

Fig 200. Nephelium Longana, Camb.

A large tree; young parts clothed with rufous-stellate pubescence. Leaves abruptly-pinnate, 6″-10″ long; leaflets 2-4 pairs, coriaceous, entire, elliptic-ovate or ovate-lanceolate, acute or obtuse at the apex, sometimes mucronate, often oblique at the base, glabrous above, glaucous beneath; blade 2·5″-9″ by ·75″-3″; petiolules short, ·2″ long; lateral-nerves 10-16 pairs, distinct and prominent beneath. Flowers yellowish-white, in copious, terminal or axillary, hairy panicles, 6″-10″ long; male and hermaphrodite mixed. Calyx 5-divided; lobes imbricate, yellow-tomentose. Petals 5, spathulate, hairy on the inside, as long as the calyx,

inserted between the calyx-lobes and the hairy disk. Stamens usually 10, exserted in the male and included in the hermaphrodite flowers; filaments hairy. Ovary hairy at the base, 2-3-lobed; stigmas 2-3, reflexed. Fruit supported by the persistent calyx, tubercled, globose, ·5″ in diameter; arillus pale, fleshy, completely covering the black, shining seed.

Burmah, Pegu, Western Peninsula from the Konkan southwards, Ceylon common. In the evergreen monsoon and rain-forests of the Konkan, Mahableshwar, Tannah etc. North Kanara, common in the forests near the Ainshi and Gairsoppah ghàts, often cultivated in tropical countries. Fl. Mch. Fr. R. S.

A large, handsome, evergreen tree, with a tall, straight, cylindrical stem. Young leaves red. Bark smooth, grey, scaly. Wood red, moderately-hard, liable to split. Pores small, numerous. Medullary rays fine and very fine, crossed by prominent wavy, concentric bands. Weighs about 60 lbs. to the cub. ft.; not much used in North Kanara. Fruit edible with a sweet pulp, very like a small *Litchi*.

N. Litchi, Camb. Fl. Br. I. 1, 687. *Litchi,* Vern., is cultivated near Bombay.

This tree was introduced into India from South China. The well known *Litchi* fruit ripens in May.

7. HARPULLIA, Roxb.

Trees. Leaves alternate, exstipulate, imparipinnate; leaflets alternate, ovate, glabrous. Flowers regular, polygamo-diœcious, paniculate. Sepals 4-5, equal, erect, very imbricate. Petals 4-5, obovate, clawed, without glands or scales. Stamens 5-8, elongate, inserted on the disk. Ovary oblong, 2-lobed, 2-celled; ovules 2 in each cell, superposed; style elongated; stigma linear, sometimes spirally twisted. Fruit a 2-lobed inflated, loculicidally 2-valved capsule; valves 1-2-seeded. Seeds subglobose, arillate; embryo thick; cotyledons large, hemispheric.

H. imbricata, Thwaites Enum. 56; Cooke Fl. Pres. Bomb. 1, 268; Trimen Fl. Ceyl. 1, 311; Bedd. Fl. Sylv. t. 158; *H. cupanioides,* Hiern, not of Roxb.; Fl. Br. I. 1, 692; Talb. Trees Bomb. 2nd ed. 110. *Bidsale,* K.

A large evergreen tree. Leaves 6″-18″ long; leaflets 6-12, alternate or opposite, ovate or elliptic, oblique at the base, shining above, glabrescent, paler beneath, thinly coriaceous; venation conspicuous beneath; blade 2″-9″ by 1″-3″; petiolules about ·3″ long. Flowers yellowish, in lax, axillary or subterminal panicles. Calyx tomentose, ·25″ long, deciduous. Petals twice the calyx, glabrous, obtuse. Stigma entire or subentire, sometimes twisted, exserted. Capsule pendulous, didymous, about 2″ broad and 1″ long, depressed between the lobes and

often crowned with the remains of the style and stigma; pericarp chartaceous, bright orange-coloured. Seed black with a small cup-shaped aril; usually not more than 1 in each mature capsule.

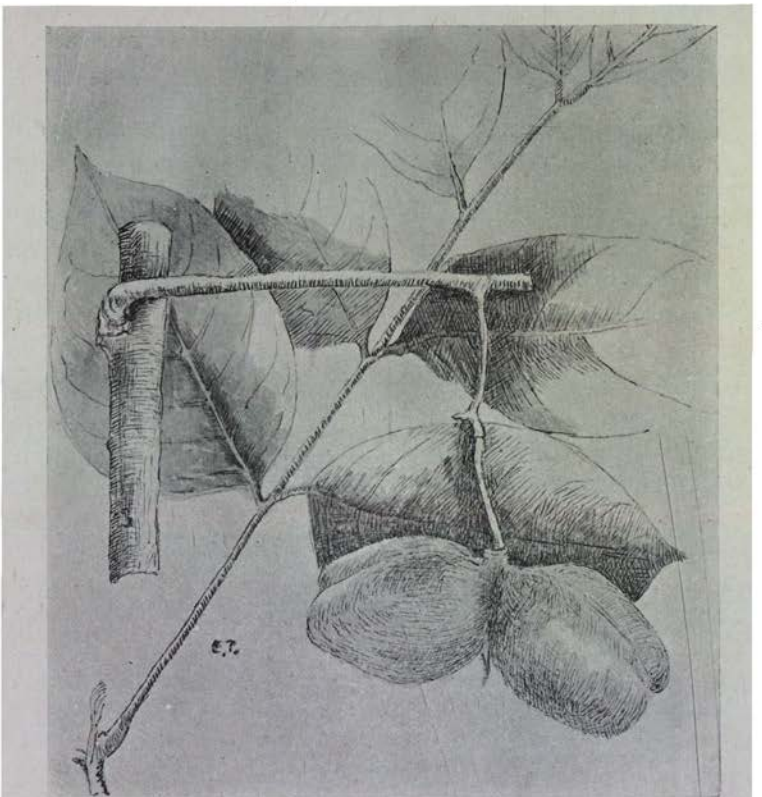


Fig 201. Harpullia imbricata, Thw.

Western Peninsula from the Konkan, southwards to Ceylon. In the evergreen monsoon and rain-forests of the Konkan and North Kanara; very common in the forests near Goond. Fl. Dec. Jan. Fr. Mch. April. A large or moderate-sized, ornamental tree. Bark pale, smooth. Wood yellowish-grey, smooth, compact, moderately-hard. Annual-rings distinct. Pores small, equally distributed. Medullary rays white, wavy, fine and very fine. Weighs 46 lbs. to the cub. ft. The fruit contains saponaceous matter and is used for washing purposes in Ceylon.

Beddome remarks that the stigma is much more twisted in the Ceylon specimens than in those from the Western Peninsula. In the North Kanara tree the

stigma seems to be usually entire and not at all twisted. The orange-coloured, inflated fruit is conspicuous during the hot season in many of the Kanara rain-forests. Roxburgh's *H. cupanioides* is apparently another and quite distinct species as pointed out by Dr. T. Cooke.

8. DODONÆA, Linn.

Erect shrubs. Leaves alternate, exstipulate, usually simple. Flowers small, polygamous, or unisexual. Inflorescence various, terminal or axillary. Sepals 5-2, imbricate or valvate. Petals O. Stamens 10-5, usually 8, inserted on the outer side of the disk. Disk small or inconspicuous. Ovary 3-6-angled and celled; style 3-6-sided, 3-6-cleft at the apex. Capsule membranous, septicidally 2-6-valved; valves winged at the back; cells 1-2-seeded. Seeds lenticular or subglobose, with a thickened funicle, exarillate, exalbuminous; embryo spirally involute.

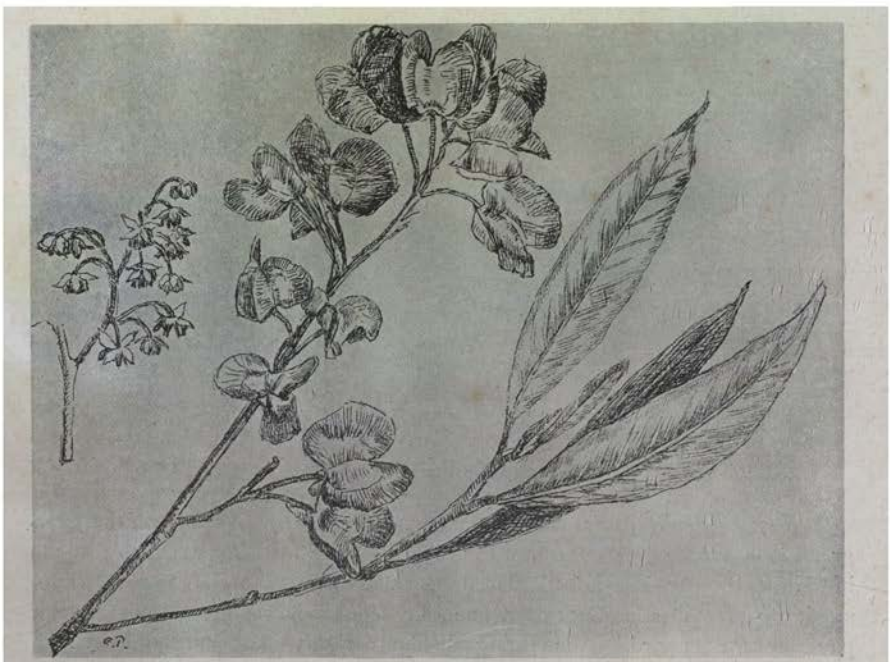


Fig 202. Dodonæa viscosa, Linn.

D. viscosa, Linn. Mant. Pl. Alt. 228; Fl. Br. I. 1, 697; Brandis For. Fl. 113; Bedd. Fl. Sylv. 75; Cooke Fl. Pres. Bomb. 1, 269; Trimen Fl. Ceyl. 1, 312;

Gamble Ind. Timb. 202; *D. Burmanniana,* Dalz. & Gibs. Bomb, Fl. 36. *Lutchmi, jakhmi, paorki,* M. *Bundurgi,* K.

An evergreen shrub; leaves, young shoots etc. covered with a bright-yellow resin. Leaves linear-cuneate or oblanceolate, sub-sessile, cuneate at the base, glabrous, 1″-5″ by ·5″-1·5″. Flowers in short, terminal panicles or racemes. Sepals ovate, about ·1″ long, in the male flower as long as the stamens. Ovary hairy; style long. Capsule membranous, notched at base and apex, with 2-3-4 marginal wings, ·6″-1″ broad; seeds dark-brown or black.

Throughout the drier parts of India; very common and gregarious over large areas of the Deccan; common in the dry districts of the Bombay Presidency and Sind; outside India it is found in Ceylon, Africa, Australia, America, China, Polynesia, etc. planted and used as a hedge plant in many localities. Fl. R. S. Fr. R. & C. S.

An evergreen often gregarious shrub with thin, grey bark which comes off in long strips. In the Nilghiris where it is found up to 8000′, sometimes becomes a small tree. Wood very hard, yellowish-brown, close-grained. Distinct rings of growth marked by fine white lines. Medullary rays fine, white, numerous. Weighs 75 lbs. to the cub. ft. Used for engraving, tool-handles and walking sticks.

9. TURPINIA, VENT.

Glabrous trees or shrubs. Leaves opposite, odd-pinnate; leaflets stipulate serrulate, subcoriaceous. Flowers small, regular, hermaphrodite, in terminal or axillary panicles. Calyx 5-partite, imbricate. Petals 5, imbricate. Stamens 5, inserted outside the disk. Disk cup-shaped, lobed or crenulate. Ovary sessile, 3-lobed and-celled; styles 3, distinct or united; ovules 2 in each cell or many in 2 series, anatropal. Fruit subglobose, indehiscent, 3-celled. Seeds angular, exarillate; testa hard, shining; albumen fleshy; embryo straight.

T. pomifera, DC. Prodr. II, 3; Fl. Br. I. 1, 698; Gamble Ind. Timb. 203; Trimen Fl. of Ceylon, 1, 313; Cooke Fl. Pres. Bomb. 1, 270; *T. nepalensis,* Bedd. Fl. Sylv. t. 159; Gamble Ind. Timb. 102. *Nila,* Budaga.

A large or very large tree; young parts glabrous. Leaves 6″-15″ long, stipulate; stipules intrapetiolar, small, triangular, caducous; rachis furrowed petioles 4″ long; leaflets 1-3 pairs with an odd terminal one, 2·5″-8″ by 1″-3″, ovate or oblong, lanceolate, shortly and abruptly-acuminate, coriaceous, thick, shining, finely serrate; petiolule of terminal 1·5″, of lateral ·6″-·2″ long; lateral-nerves 6 pairs, distant, strong beneath. Inflorescence in lax, axillary or terminal panicles, shorter than the leaves. Flowers small, white, sweet-scented, on short, slender pedicels. Calyx-lobes oblong, obtuse, ciliate. Petals obtuse, slightly

exceeding the calyx. Stamens shorter than petals. Ovary ovoid, glabrous, tapering into a stout style. Fruit globose, smooth, purplish-black, seated on the calyx-lobes, ·5″-1″ in diameter; pericarp hard, fleshy; seeds angular, dark-brown, shining.

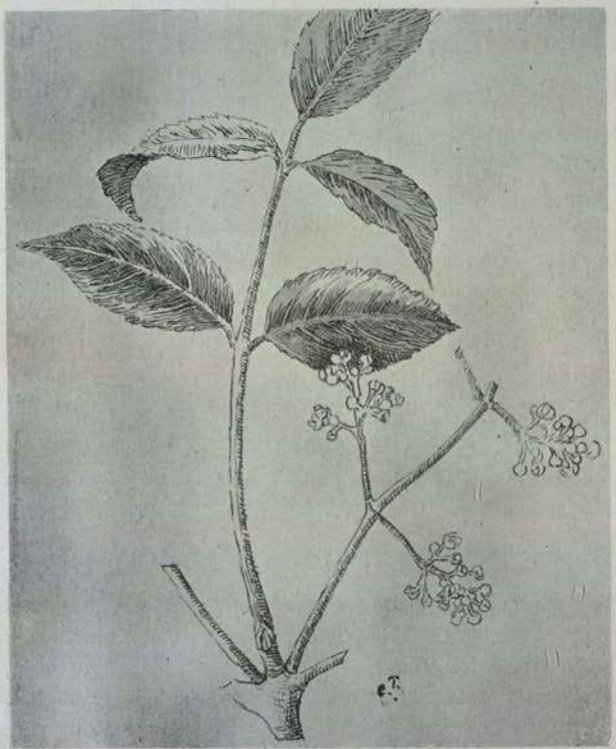


Fig 203. Turpinia pomifera, DC.

Himalayas from Nepal eastwards, Assam, Cachar and Burma; Western Peninsula from the Konkan southwards. In the rain-forests of the North Kanara ghâts, abundant near Sirsi. Fl. Dec-Jany. Fr. H. S.

An evergreen tree with thin, grey, smooth bark. Wood grey, soft, evengrained; weighs about 30 lbs. to the cub. ft.

Order XXXIV—SABIACEÆ.

Shrubs or trees, rarely climbers. Leaves alternate, simple or pinnate. Flowers small, hermaphrodite or polygamous, bracteate; inflorescence usually a panicle. Calyx 4-5-partite, imbricate. Petals 4-5, equal or unequal, opposite to or alternating with the sepals. Disk small, annular. Stamens 4-5, opposite the petals, inserted at the base of or on the disk, usually 2 only perfect and 3 without anthers; filaments dilated at top; anther-cells separated by a thick connective. Ovary 2-3-celled, compressed or 2-3-lobed; styles 2-3, free or connate or O; stigmas punctiform; ovules 1-2 in each cell. Ripe carpels 1-2, drupaceous or dry; endocarp crustaceous or bony; albumen O or scanty.

MELIOSMA, BLUME.

Trees or shrubs, usually pubescent or tomentose. Leaves alternate, simple or imparipinnate; leaflets opposite. Flowers minute, in large, thyrsoid panicles; bracts caducous; bracteoles and sepals 5-7, persistent. Petals 5, very unequal, the 2 smaller inferior behind the fertile stamens, sometimes 2-cleft. Stamens 5, 2 fertile opposite the smaller petals, with short, flat, incurved filaments, expanded into a cup at the top, containing 2 globose cells, elastically and transversely dehiscent and 3 deformed, broad filaments opposite the larger petals, 2-fid with 2 empty cells, together forming a cup over the pistil. Disk annular, toothed. Ovary sessile, 2, rarely 3-celled, surrounded at the base by the cup-shaped, membranous disk with 2 horizontal or pendulous ovules in each cell. Drupe obliquely-globular; stone bony or crustaceous, 1, rarely 2-celled.

M. Wightii, Planch. in Herb. Hook.; Fl. Br. I. 2, 4; Brandis For. Fl. 116; *M. pungens,* Wall.; Bedd. Fl. Sylv. 77. *Hill Mango.*

A small tree of the W. Ghâts, above 5000′ elevation, Ceylon, upper "montane" zone common, apparently not indigenous in the Bombay Presidency. Dr. Cooke mentions in his Fl. Pres. Bomb. that there is a specimen from Bombay, presumably in the Kew herbarium, of this species collected by Dalzell. No details are however given.

Order XXXV—ANACARDIACEÆ.

Trees or rarely shrubs, often with acrid juice. Leaves simple or compound, usually alternate, exstipulate. Flowers small, usually regular, unisexual or hermaphrodite. Calyx 3-5-partite. Petals as many as calyx-divisions, mostly imbricate. Disk usually annular. Stamens as many, often twice as many, as the petals, inserted under the base, rarely on the disk, all perfect or variously imperfect. Ovary unilocular, (in *Spondias* 5-celled, in *Buchanania* of 5 distinct carpels) superior or half inferior; ovules solitary in the cells, pendulous from the top or wall or from an ascending basal funicle; styles 1-5. Fruit a drupe, 1-5-celled and-seeded. Seeds exalbuminous; cotyledons usually plano-convex, fleshy; radicle short, straight or incurved, superior or inferior.

Fruit 1-celled, 1-seeded.
- Ovules pendulous from an ascending basal funicle.
  - Leaves palmately trifoliate or compound ... 1. Rhus.
  - Leaves simple, alternate.
    - Peduncle not enlarged in fruit.
      - Stamens 1-5. Fruit a large, fleshy drupe with a compressed, fibrous stone ... 2. Mangifera.
      - Stamens 10. Fruit a small drupe with a crustaceous or bony stone ... ... 3. Buchanania.
    - Peduncle enlarged in fruit ... ... 4. Anacardium.
- Ovules pendulous from the top of the cell or from the walls of the ovary above the middle.
  - Leaves pinnate.
    - Petals valvate. Stamens 10. Style 1. ... 5. Solenocarpus.
    - Petals imbricate. Stamens 8-10.
      - Styles 3-4 ... ... 6. Odina.
  - Leaves simple.
    - Stamens 5.
      - Petals imbricate. Styles 3. Disk broad, annular ... ... 7. Semecarpus.
      - Petals valvate. Styles 3-5. Disk lining the calyx-tube ... ... 8. Holigarna.
    - Stamens 4.
      - Style 1, short. Disk annular, 4-5-lobed ... 9. Nothopegia.

Fruit 2-5-seeded.

Ovules pendulous in the cells. Leaves alternate, oddpinnate ... ... 10. Spondias.

1. RHUS. Linn.

Trees or shrubs with resinous, often acrid juice. Leaves alternate, pinnate or 1-3-foliate, rarely simple, exstipulate. Flowers small, white or greenish, generally dicœcious, in axillary or terminal panicles. Calyx small, 4-6-partite, persistent, imbricate. Petals as many as the sepal-lobes, deciduous, equal, inserted on the base of the calyx, outside the disk. Disk fleshy, annular or 5-lobed, adnate to the base of the calyx. Stamens 5, free, inserted on or under the edge of the disk; anthers imperfect in the fem. flowers. Ovary sessile, ovoid or globose, 1-celled; styles 3, short or long; stigmas simple or capitate; ovule solitary, anatropous, suspended from a filiform, basal funicle. Drupe small, dry, compressed; stone bony or crustaceous; albumen O; cotyledons flat; radicle curved, short, superior.

Fig 203. Rhus mysurensis, Heyne.

R. mysurensis, Heyne; W. & A. Prodr. 172; Fl. Br. I. 2, 9; Brandis For. Fl. 119; Bedd. Fl. Sylv. 78; Cooke Fl. Pres. Bomb. 1, 273; Engler in DC. Monogr. Ph. v. 4, 420; Gamble Ind. Timb. 208. *Amoni,* Vern.

A shrub or small tree; branches brown-tomentose and often spinescent. Leaves shortly fulvous-pilose beneath, glabrous above, except the midrib; leaflets obovate or cuneate, deeply dentate or lobed; the 2 lateral leaflets smaller than

the terminal, all sessile; terminal 1″-1·5″ long; petioles about ·5″ long; lateral-nerves distinct, prominent beneath. Flowers ·8″ in diameter, in slender, terminal or axillary, branched, pubescent panicles. Calyx minute, pubescent outside; lobes ovate. Petals oblong, much larger than the sepals. Stamens short. Disk 5-lobed. Drupes glabrous, brown-shining, compressed, about ·12″ in diameter.

N. W. India, Sind, Punjab, Rajputana, W. Peninsula; throughout the dry Deccan districts, Dharwar, Bellary and Mysore; common in the dry, mixed-forest at the base of the Bababuden Hills near Lingadhully. Fl. Feb., Fr. April. A small aromatic, often gregarious, sometimes spinous tree or shrub. Bark thin, rough. Rhytidome of hard, black, small scales; inner-bark red. Wood hard, yellowish, close-grained, heavy. Pores moderate-sized, evenly distributed. Medullary rays fine, numerous, wavy. The bark contains 15 per cent. of tannic acid and gives a fine brown colour to leather.

2. MANGIFERA, Linn.

Trees. Leaves simple, alternate, coriaceous, entire. Flowers small, polygamous, in terminal panicles. Calyx 4-5-partite; segments imbricate, deciduous. Petals 4-5, free or adnate to the disk, imbricate. Stamens 4-5, inserted on the disk, one only perfect, much larger than the others. Ovary sessile, 1-celled, oblique; style simple, lateral; ovule 1, pendulous, attached to the side of the cell above the base. Fruit a large fleshy drupe; stone compressed, fibrous, testa papery; cotyledons plano-convex often unequal and lobed; radicle inferior.

M. indica, Linn. Fl. Fr. I. 2, 13; Dalz. & Gibs. Bomb. Fl. 51; Brandis For. Fl. 125; Bedd. Fl. Sylv. t. 162; Cooke Fl. Pres. Bomb. 1, 273; Gamble, Ind. Timb. 211. *The Mango Tree; Mavina-mara,* K.; *Amba,* M.

A large tree, glabrous except the inflorescence. Leaves oblong, lanceolate, acute or acuminate, entire, coriaceous, glabrous, shining above, 5″-10″ by 1·5″-3″; petioles ·5″-2·5″ long. Flowers monœcious, ·2″ long, in large terminal pubescent panicles 1′ and more in length. Sepals ovate, concave, pubescent outside. Petals oblong, longer than the sepals with 3 orange-coloured, confluent ridges on the inner face. Disk tumid, 5-lobed. Stamens: 1 with a subulate filament and a purple anther, the other 4 reduced to filaments. Ovary glabrous; style, simple, lateral. Drupes large, fleshy, subovoid, somewhat compressed, 2″-8″ long.

Tropical Himalaya 1-3000′, from the Konkan to Bhutan, Behar, Khasia Mts.; Burma, Sikkim, Oudh and the Western peninsula. Mr. Gamble has found it apparently wild in the S. Deccan on the Cuddapah hills. In the rain-forests of the Konkan and N. Kanara ghâts and the Satpudas; usually cultivated throughout the Presidency and Sind, principally for its fruit which is next to the plantain the most important in India. A large evergreen tree. Bark thick,

brown or blackish, rough with exfoliating scales. Wood dull-grey with darker patches or streaks, soft, open-grained. Pores few, moderate-sized and large, sub-divided and joined by short concentric bands. Medullary rays fine, closely packed and wavy. Weighs 38-44 lbs. to the cub. ft. Used for planking, canoes, packing cases, tea boxes etc. The bark yields a gum, the seeds contain gallic acid and the leaves are astringent and contain tannin; all are used in native medicine. The mango is not of great importance as a forest species. The numerous shady groves, avenues and isolated trees throughout the country have certainly some climatic influence as they must affect the amount of annual rainfall and its distribution.

3. BUCHANANIA, Roxb.

Trees. Leaves simple, coriaceous, villous or glaucous, entire. Panicles terminal. Flowers small, white, hermaphrodite. Calyx 3-5-lobed, persistent, imbricate. Petals 4-5, oblong, imbricate in bud. Disk between the ovaries and the stamens, orbicular, 5-lobed. Stamens 10, inserted outside the crenate, orbicular disk at its base; anthers basifixed. Carpels 5-6, distinct, in cavity of disk, only 1 fertile, 1-celled; ovule 1, attached to a funicle proceeding from the base of the ovary. Drupe with a bony stone, 2-valved.

Leaves and panicles villous	...	...	... 1.	B. latifolia.
Leaves and panicles glabrous	...	...	... 2.	B. angustifolia.

1. B. latifolia, Roxb. Fl. Ind. 2, 385; Fl. Br. I. 2, 23; Bedd. Fl. Sylv. t. 165; Brandis For. Fl. 127; Dalz. & Gibs. Bomb. Fl. 52; *B. Lanzan,* Spreng.; Cooke Fl. Pres. Bomb. 1, 275. *Char, charoli,* M.; *Nurkal,* K.; *Payal,* Vern.

A moderate-sized tree; young parts, inflorescence etc. densely pubescent. Leaves thick, coriaceous, broadly-oblong, obtuse, glabrous, shining above, densely villous beneath, 5″-10″ by 2·5″-5″; lateral-nerves 10-20 pairs, strong beneath; petioles ·5″ long. Flowers small, sessile, greenish-white, in large, congested, terminal or axillary, many-flowered panicles, shorter than the leaves. Calyx-lobes short, ovate, ciliate. Petals ovate-oblong, ·1″ long, acute, glabrous. Stamens 10, included. Disk fleshy, red-coloured, 5-6-lobed. Ovary of 1 central fertile carpel, hairy at the base; style short; stigma truncate. The sterile carpels are reduced to short subulate styles, slightly thickened upwards. Drupes black sub-globose, compressed, ·4″ long; putamen hard, bony, 2-valved.

Dry and open forests, throughout India and Burma, Central and Southern India and the Western Peninsula. Fl. Jan.-Mch. Fr. Apl.-May. A moderate-sized tree not very high with a girth of 4′-5′, leafless for a very short time in the hot season. Trunk straight. Bark very characteristic, 1″ thick, usually black, rough, tesselated with deeper regular cracks. Wood greyish-brown, even-grained,

moderately-hard; seasons well. Pores large, round, single or subdivided. Medullary rays very fine, reddish, somewhat indistinct. Weighs about 33 lbs. to the cub. ft. "Used for boxes, door and window frames, tables, and other furniture." Brandis. In N. Kanara however the wood is of poor quality and is scarcely used even for fuel. It yields copiously a gum partially soluble in water, reported to be probably of commercial value. The bark is used for tanning. The fruit is edible and the kernels from which oil is extracted, taste like pistachio nuts and are used extensively in the manufacture of sweetmeats.

2. B. angustifolia, Roxb. Fl. Ind. 2, 386; Fl. Br. I. 2, 23; Grah. Cat. Bomb. Pl. 41.; Wight Ic. t. 101; Trimen Fl. Ceyl. 1, 386.

A small tree, glabrous throughout. Leaves obovate, elliptic or elliptic-lanceolate, obtuse or emarginate, 4″-2·5″ by 1·5″-·75″, coriaceous, shining above; lateral-nerves about 10 pairs, prominent; petioles slender ·4″-1″ long. Flowers small, white, nearly sessile, in axillary or terminal branched panicles shorter than the leaves. Calyx 5-lobed; lobes rounded. Petals ovate-obtuse, ·1″ long. Stamens ½ as long as the petals. Disk thick, lobed. Carpels 5-6, reduced to sterile, flattened styles closely surrounding the single central fertile carpel which has a very short style. Drupe obliquely-ovoid, ·5″ long, compressed.

Western Peninsula, Konkan from the Ajunta jungles southwards to Ceylon. This species does not appear to have been seen in Bombay by any botanist since Graham who found it in the jungles near the Ajunta caves. The ovaries are represented as hairy in Wight's Icones, t. 101. Specimens from Cuddapah, Madras Presidency, have the flowers quite glabrous and they are described as such in Trimen's Flora of Ceylon. It is remarkable that the species or a variety of it should be found in and the common Indian *B. latifolia*, be absent from Ceylon.

4. ANACARDIUM, ROTTL.

Trees or shrubs. Leaves petioled, simple. Flowers polygamous in terminal, bracteate panicles. Calyx 5-partite; segments erect, imbricate, deciduous. Petals 5, linear-lanceolate, recurved, imbricate. Disk erect. Stamens 8-10; filaments connate and adnate to disk, all or some fertile. Ovary obovoid; style filiform excentric; stigma minute; ovule 1, ascending from a lateral funicle. Nut kidney-shaped, on enlarged disk and peduncle; pericarp cellular and full of oil. Seed kidney-shaped; testa membranous, adherent; cotyledons semilunar; radicle short, hooked.

A. occidentale, Linn.; Fl. Br I. 2, 20; Dalz. & Gibs. Bomb. Fl. Suppl. 18; Bedd. Fl. Sylv. t. 163; Cooke Fl. Pres. Bomb. 1, 274; Gamble Ind. Timb. 214. *Godambe* K.; *Kaju,* M.; *Goru-mavu* in Dharwar; *Hijuli-badam* or *Cashewnut.*

A moderate-sized or small tree, usually with a short, thick trunk and glabrous smooth branches. Leaves entire, coriaceous, glabrous, shining above, oblong, obtuse, cuneate at the base, 4″-6″ by 2·5″-3″; lateral-nerves 8, parallel pairs, strong beneath. Flowers yellow with pink stripes, in terminal panicles with cymose branches, longer than the leaves. Bracts ovate-acute, nerved, puberulous, ·25″ long. Sepals lanceolate, puberulous. Petals linear-lanceolate very acute, recurved, ·5″ long Disk filling the base of the calyx. Stamens about 9, one longer than the rest, all fertile. Fruit 1″ long, on a pyriform orange or red-coloured, fleshy hypocarp, 2″-3″ long.

Fig 205. Anacardium occidentale, Linn.

Throughout the Presidency naturalized and completely established; very common near the seashore in open situations. A native of S. America.

An evergreen tree with thick, rough grey-coloured bark, important in the reclamation of the sand dunes along the coast. Wood red, moderately-hard, shining, close-grained. Pores large. Medullary rays indistinct. Weighs 38 lbs. to the cub. ft. Used for boat-building, etc. A light yellow, bland oil is extracted from the kernels of the seed which is considered superior to olive oil. From the pericarp or the shell a black, acrid oil *(cardoloil)* used to colour fishing nets is

prepared. This oil is used in native medicine for removing warts, corns etc. Yields the edible *cashewnut*. The fleshy stalk is also eaten as fruit. The bark is astringent.

5. SOLENOCARPUS, Wgt. & Arn.

A tree. Leaves oddpinnate; leaflets opposite, glabrous, crenulate. Flowers small, hermaphrodite, in terminal panicles. Calyx minute, 5-toothed, at length deciduous. Petals 5, oblong, valvate. Stamens 10, inserted at the base of the annular disk; filaments elongated, filiform; anthers versatile. Ovary oblong-ovoid, unilocular, sessile; ovule pendulous from near the top of the cell; style thick, clavate, obliquely-truncate at the apex. Fruit a small, compressed, obliquely-oblong, truncate drupe; pericarp cellular, full of oil; endocarp bony; cotyledons linear; plano-convex; radicle short, thick, superior.

S. indica, Wgt. & Arn. Prodr. 1, 171; Fl. Br. I. 2, 27; Bedd. Fl. Sylv. t. 233; Engler in DC. Mongr. Ph. v. 4, 250; Cooke Fl. Pres Bomb. 1, 277.

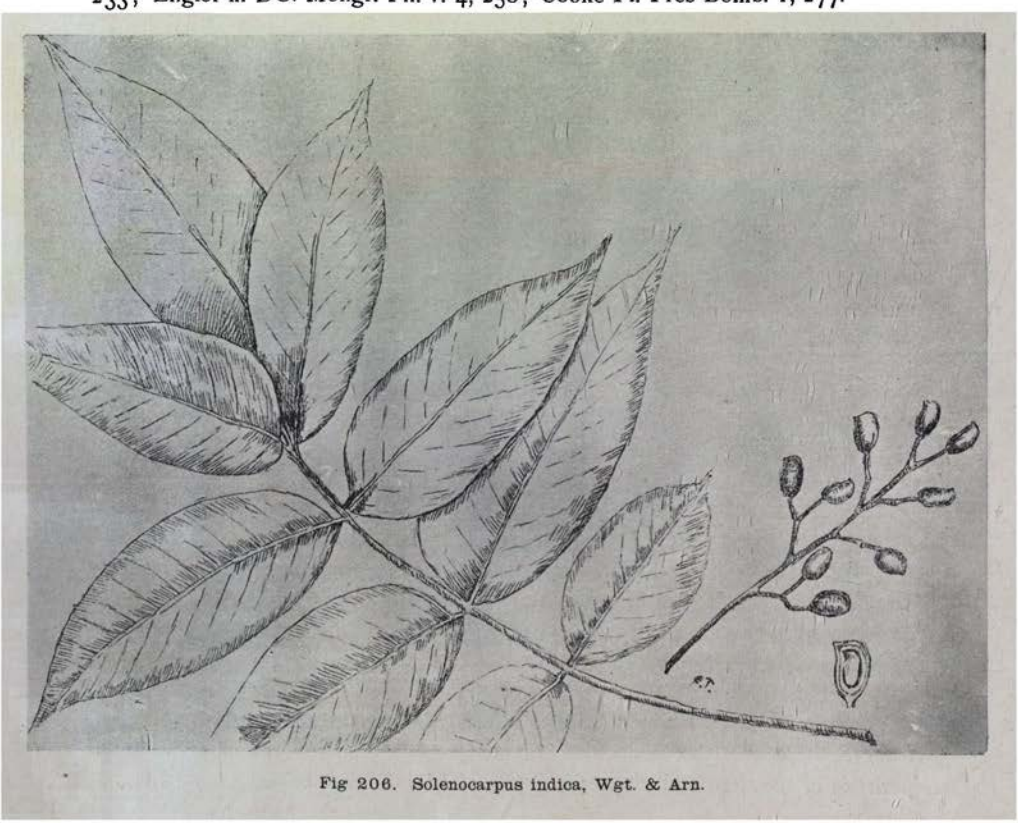


Fig 206. Solenocarpus indica, Wgt. & Arn.

A moderate-sized tree; young shoots puberulous. Leaves fascicled at the ends of the branches, 6″-12″ long; petioles angled, pubescent; leaflets 5-7, in opposite or subopposite pairs with an odd one which is long-petiolulate; the others sessile, oblong, acuminate or acute at the apex, oblique at the base, slightly crenate, coriaceous, glabrous in age; blade 2″-2·5″ by ·75″-1″. Flowers small, numerous, pure-white, in panicles fascicled at the ends of the old branches. Calyx-lobes very minute, deltoid. Petals 3-4, oblong-lanceolate, ·12″ long, reflexed. Disk 8-10-lobed. Stamens 8-10; anthers linear. Fruit ovoid, pointed about ·25″ long; pedicels ·20″ long, thickened and articulate at the base.

Western Peninsula from N. Kanara southwards to Malabar, Travancore and the Anamullays, ascending to 2,500′, Nilghiris and Kurg; in rain-forest near Yellapore, N. Kanara, rare. Flowers in Nov. Fruit Jan.-Feb.

6. ODINA, Roxb.

Trees with thick, soft branches. Leaves at the ends of the branches, oddpinnate, deciduous; leaflets opposite, quite entire. Flowers small, shortly pedicelled, monœcious or diœcious, fascicled, in terminal panicles. Calyx 4-5-lobed, persistent. Petals 4-5, imbricate. Disk annular, lobed. Male Fl.: Stamens 8-10, inserted within the disk. Ovary 4-5-parted. Fem. fl.: Ovary sessile, oblong, 1-celled; styles 3-4, stout; stigmas simple; ovule pendulous from near the top of the cell. Drupe small, red; stone hard. Seed compressed; embryo curved; cotyledons flat, fleshy; radicle superior.

O. Wodier, Roxb. Fl. Ind. 2, 293; Fl. Br. I. 2, 29; Bedd. Fl. Sylv. t. 123; Dalz. & Gibs. Bomb. Fl. 51; Gamble Ind. Timb. 218; Brandis For. Fl. 123. *Gugul,* K.; *Moee, shembat, shimti,* M.; *Monia,* Vern.

A moderate-sized or sometimes a large tree. Leaves 12″-18″ long, crowded at the ends of the branches; leaflets 3-4-pairs with an odd one, 3″-6″ by 1″-2″, thin, glabrous-shining, ovate, caudate-acuminate, base acute or rounded, often oblique; lateral-nerves parallel, about 12 pairs, prominent beneath. Flowers yellowish, very small, tetramerous, about ·2″ in diameter. Male fl. fascicled, arranged in long, slender, compound racemes. Fem. fl.: in simple pubescent racemes; pedicels very short; bracts broad-ovate, numerous, ciliate. Male fl.: Calyx 4-lobed; lobes imbricate. Petals 4, reflexed. Stamens 8. Ovary 4-divided, rudimentary. Fem. fl.: Ovary sessile; styles 4, short, thick, distinct; staminodes on the disk surrounding the ovary. Drupes in lax panicles, ovoid, oblique, ·3″ long, compressed; pericarp fibrous; seeds large, oily.

Throughout the dry forests of India, Assam, Burmah, Ceylon and the Andamans; common in the Khandesh and Deccan jungles where it is associated with *Boswellia serrata, Anogeissus latifolia,* and other fire resisting species; ascends

to 3500′ in the Akrani and is also found in the mixed monsoon-forests on laterite near the sea coast of N. Kanara. Fl. Feb.-Apl. Fr. June onwards. The fresh foliage appears just after or along with the flowers from Feb. onwards. The tree is however generally leafless during the dry season. Usually a moderate-sized tree with a straight trunk, 40′ to 50′ high and with a diameter of 1·5 to 2. Bark

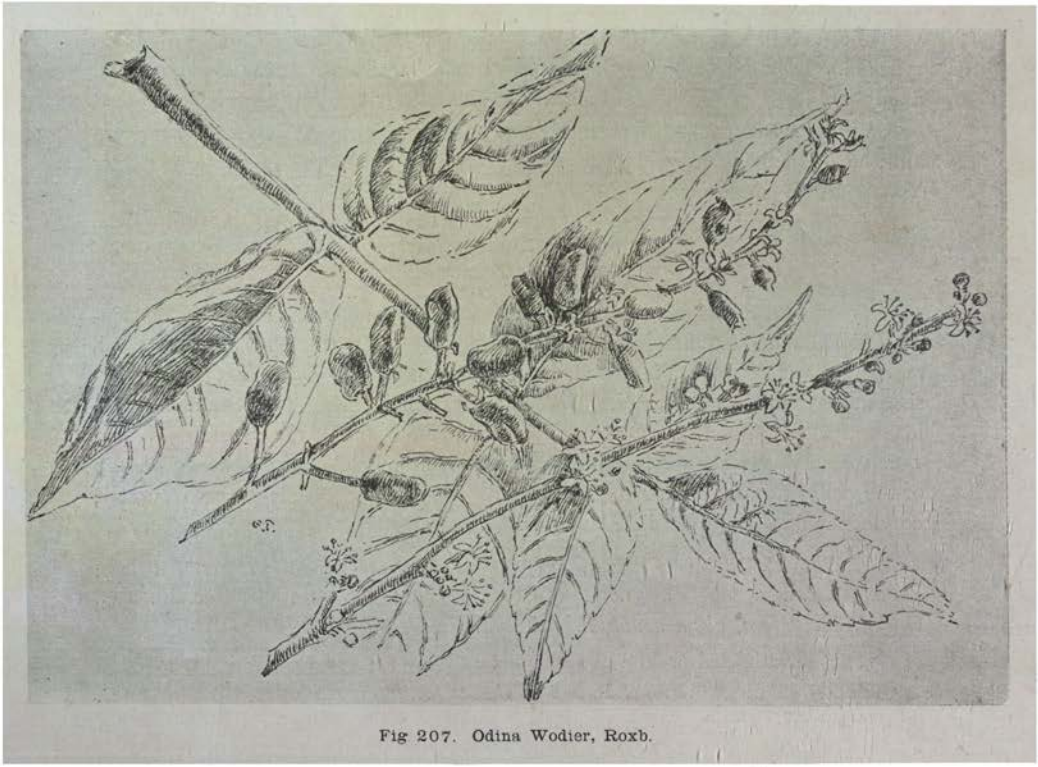


Fig 207. Odina Wodier, Roxb.

ash-coloured, thick, scaly; inner-bark red, mucilaginous. Wood (heartwood) red, smooth, heavy; sapwood large, white. Pores moderate-sized scanty, mostly subdivided, equally distributed. Medullary rays fine, equal, short, distinct. Annual-rings visible. Weighs 60 lbs. to the cub. ft. Used for sugarcane presses, etc. Yields a yellowish gum much in demand by cloth weavers, also used in medicine. Bark contains 9 per cent of tannin. The young leaves and branches are a favourite cattle fodder.

7. SEMECARPUS, LINN. F.

Trees. Leaves simple, entire, coriaceous. Flowers small, polygamous or dicœcious, in terminal panicles. Calyx 5-6-fid; segments deciduous. Petals 5-6, imbricate. Disk broad, annular. Stamens 5-6, inserted at the base of the disk outside, imperfect in the female flowers. Ovary 1-celled; styles 3, subclavate; ovule pendulous from a basal-funicle. Drupe oblong, fleshy, seated on the thickened disk and calyx base; pericarp filled with acrid resin. Seed pendulous; testa coriaceous; inner coat somewhat fleshy; embryo thick; cotyledons plano-convex; radicle superior.

S. Anacardium, Linn. f. Fl. Br. I. 2, 30; Dalz. & Gibs. Bomb. Fl. 52; Bedd. Fl. Sylv. t. 166; Brandis For. Fl. 124; Wight Icones t. 558; Cooke Fl. Pres. Bomb. 1, 278; Gamble Ind. Timb. 220. *Marking Nut Tree; Bibha, biba,* M.; *Gero, oor-gero, ger,* K.

Fig 208. Semecarpus Anacardium, Linn.

A medium-sized tree; young parts harshly tomentose. Leaves crowded at the ends of the branches, 7″-24″ by 4″-12″, obovate-oblong, base rounded, cordate or cuneate, coriaceous, shining above, more or less white or buff-tomentose or glabrous beneath, margins thickened; lateral-nerves parallel, 15-25 pairs, prominent beneath; petioles thick, ·5″-1·5″ long. Flowers greenish-yellow, subsessile, fasciculate, arranged in erect, compound, terminal panicles longer or shorter than the leaves; bracts lanceolate, pilose. Male. fl.: Calyx-segments triangular, pilose. Petals ·2″ long, thick, obtuse-oblong, glabrous, 3-4 times longer than the calyx, margins white. Filaments inserted below the thick disk, subulate, sometimes thickened at the base. Ovary rudimentary. Female fl.: Ovary superior, subglobose, densely tomentose, crowned with the 3 styles. Staminodes slender, longer than the ovary, dilated at the base. Drupe 1″ long ovoid or oblong, oblique, smooth, shining, black with an orange-coloured, edible, fleshy hypocarp, ·75″ long.

Sub-Himalayan tract from the Sutlej eastwards, ascending to 3500′.; scattered throughout the hotter parts of India, absent from Burmah and Ceylon. Throughout the Presidency, abundant in dry forests. Flowers at various times. Fruit Nov.-Feb. A moderate-sized, deciduous tree. Leaves shed in Feb.; fresh foliage in May. Bark ·5″ thick, rough, dark-coloured, exfoliating in irregular patches; inner-bark fibrous. Wood greyish-brown, often with yellow streaks, soft. Pores scanty, subdivided. Medullary rays numerous, moderately-broad, reddish. Average weight per cub. ft. 37 lbs. Not much used, cracks in seasoning and is not durable. Woodcutters object to felling this tree owing to the acrid juice it contains. The fleshy somewhat astringent hypocarp is eaten either dried or roasted. The acrid juice of the pericarp is used in native medicine and for making marking-ink. Engler in his Mon. Phan, IV (1883) distinguishes 13 species of *Semecarpus* endemic in Ceylon from which island it is remarkable that the Western Peninsular *S. Anacardium*, is absent. It is probable that Graham's *S. cuneifolia*, Roxb. Cat. Bomb. Pl. 41 which he states much resembles *Holigarna Arnottiana*, Hook, f. (*H. longifolia*, W. & A.) is really *Holigarna Grahamii*, Hook. f. *S. cuneifolia*, Roxb. has not been noted by any botanist since Graham in the easily accessible jungles near Khandala where *Holigarna Grahamii*, is common.

8. HOLIGARNA, Ham.

Large trees. Leaves simple, alternate, entire, coriaceous; petioles with 2-4 spur-like, deciduous appendages. Panicles axillary or terminal. Flowers small, crowded, dicœcious. Calyx superior, 5-toothed; tube cup-shaped. Petals 5, valvate, inserted at edge of the disk, very villous in front. Disk lining the calyx-tube, often obscure in the female fl. Stamens 5, on the edge of the disk. Ovary inferior,

1-celled; styles 3-5, terminal; ovule pendulous from the top of the cell. Drupe ovoid, subcompressed, filled with resinous, acrid pulp; stone coriaceous. Seed with a membranous testa; embryo thick, often curved; cotyledons flat or plano-convex; radicle minute, next the hilum.

Leaves large or medium-sized, quite glabrous; stipular appendages 2. Fruit altogether included in the torus.

Leaves cuneate-obovate, acute, about 9″ long; lateral-nerves about 20 pairs ... ... 1. H. Arnottiana.

Leaves obovate, usually obtuse, about 6″ long; lateral-nerves about 10 pairs ... ... 2. H. ferruginea.

Leaves very large, pubescent beneath; stipular appendages usually 4. Fruit nearly included in the torus, $\frac{1}{8}$th free .... 3. H. Grahamii.

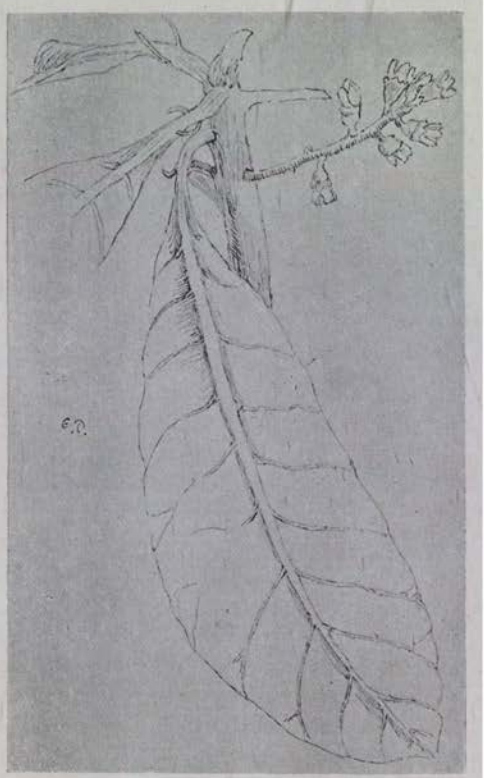


Fig 209. Holigarna ferruginea, Marchand.

1. H. Arnottiana, Hook. f.; Fl. Br. I. 2, 36; *H. longifolia,* W. & A.; Dalz. & Gibs. Bomb. Fl. 51; Bedd. Fl. Sylv. t. 167. *Holigar, hoolgeri,* K.; *Sudrabilo,* M.

A large, evergreen tree. Leaves coriaceous, cuneate-obovate, acute; blade decurrent on the stout petiole, shining dark-green above, pale or glaucous beneath; petioles with 2 linear tubercles at the top; nerves strong, prominent, parallel, 16-22 pairs; blade 6″-12″ by 2″-3·5″; petioles ·75″ long, stout. Flowers in axillary and terminal, compound, interrupted racemes, crowded at the ends of the leafy branches, longer or shorter than the leaves. Male fl. ·25″ across. Calyx rusty-pubescent, nearly truncate. Corolla of 5, acute, triangular lobes, pubescent on the outside. Stamens 5, longer than the corolla, inserted on the edge of a dark-red, and

angled disk and alternating with the corolla-lobes; anthers red, versatile, dehiscing by longitudinal side slits; pollen yellow. Fem. fl.: Ovary hairy at the apex, sunk in the disk and calyx-tube; styles 3-4; stigmas broad, flat, recurved, with irregular margins, acute, sometimes hairy. Fruit 1″ long, obliquely-oblong, black, glabrous; pedicels elongating after flowering, ·75″ long.

Endemic in the Western Peninsula from the Konkan southwards, Kurg, Travancore, Nilghiris, absent from Ceylon. In the evergreen monsoon and rain-forests of the Konkan and North Kanara, common. Fl. Jan-Feb. Fr. June-July.

A large straight evergreen tree. Bark smooth, ash-coloured. Wood grey, with large yellow patches, rather lustrous and satiny, soft. Pores large and medium-sized, scattered, appearing as long dark lines on the longitudinal section. Medullary rays medium-sized, rather short, close and numerous. Weighs 32 lbs. to the cub. ft. Used in N. Kanara for native boats, and would do well for light packing cases, cigar-boxes and such like uses. The structure of the wood is very similar to that of *H. longifolia*, Roxb. described by Gamble in his Indian Timbers.

2. H. ferruginea, Marchand Rev. Anacard. 171; Fl. Br. I. 2, 37; Monogr. Phaner. Prodr. DC. Anacard. Eng. 499.

A large or medium-sized tree. Leaves obtuse-oblong, obtuse or sometimes subacute, coriaceous, glabrous, shining above, pale beneath; petioles stout, ·5″ long with 2 linear, deciduous, stipular appendages at the top; lateral-nerves prominent beneath, about 10 pairs; blade 3″-5·5″ by 1″-1·75″. Male fl. ·25″ across, in axillary, interrupted racemose panicles, crowded at the ends of the branches and longer than the leaves. Petals ovate-acute, spreading. Calyx triangular, shallow-lobed, ferruginous-tomentose without. Disk inconspicuous. Stamens exserted. Fem. fl. much larger than the male, in short, axillary racemes or racemose-panicles, crowded at the ends of the branches and shorter than the leaves; bracteoles ovate-acute; pedicels ·25″ long. Calyx very ferruginous-tomentose without, 5-lobed; lobes very short. Petals thick, ·2″ long, oblong, acute. Stamens shorter than the petals. Ovary immersed in the calyx-tube and disk. Styles 3, unequal in length; stigmas clavate, reflexed, more or less 2-lobed. Fruit obliquely ovoid, compressed, about 1″ long, black, filled with much acrid black juice; pedicels 1″-1·25″ long, rather stout.

Endemic in the Western Peninsula from the Konkan southwards to Kurg and Travancore. In the N. Kanara forests near the coast, also found inland on the slopes of the ghâts in evergreen monsoon and rain-forests. It is probably more abundant than and possesses the same native names as the foregoing species with which it has been hitherto confounded. Fl. March-May. Fr. Rainy season.

3. H. Grahamii, Hook. f.; Fl. Br. I. 2, 37; Cooke Fl. Pres. Bomb. 1, 280; Brandis Ind. Trees, 203; *Semecarpus Grahamii,* Dalz. & Gibs. Bomb. Fl. 52; *Semecarpus cuneifolia?* Grah. Cat. Bomb Pl. 41. *Bipte, balwuli,* M.

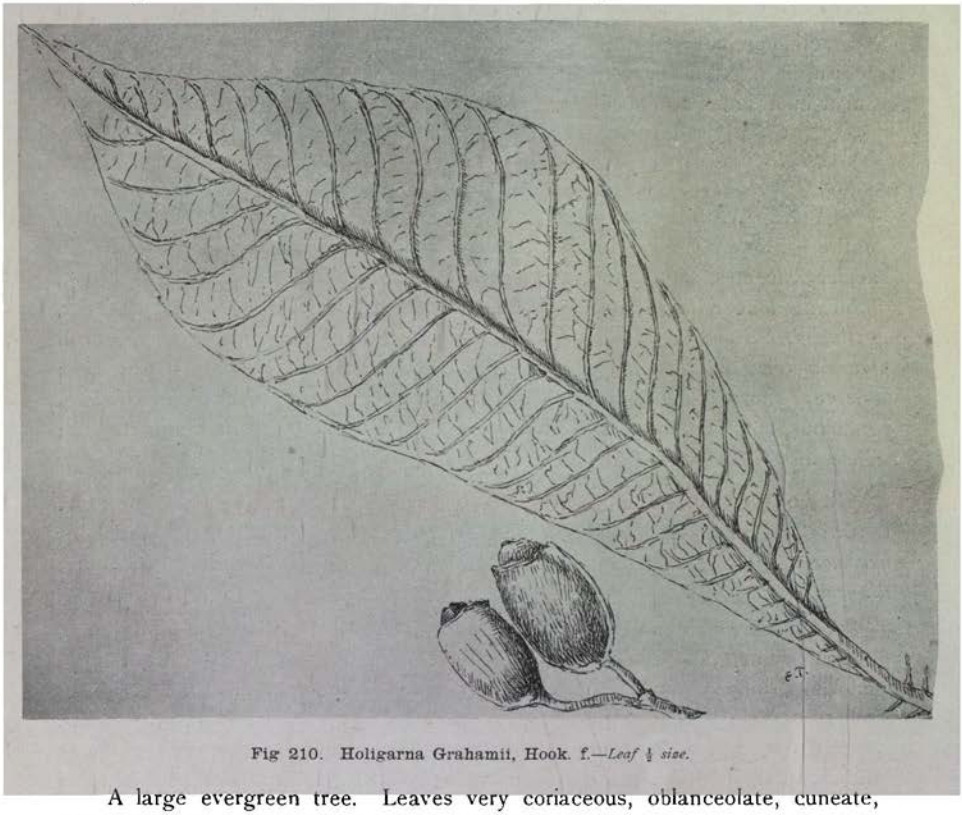


Fig 210. Holigarna Grahamii, Hook. f.—*Leaf ½ size.*

A large evergreen tree. Leaves very coriaceous, oblanceolate, cuneate, triangular above the middle, acuminate, finely pubescent beneath; petiolar-spurs 2-4, more or less persistent; lateral-nerves parallel, strong beneath, about 30 pairs; blade 12″-16″ by 4″-8″ across the broadest part; petioles short, stout, ·5″ long. Male panicles large, ferruginous, much branched, crowded at the ends of the branches. Flowers ·25″ in diameter. Calyx cupular, truncate or with broadly triangular or obtuse lobes. Petals oblong. Stamens slightly exserted. Female fl. in shorter panicles than the males. Disk thick with a raised margin. Styles 3-4, unequal in length; stigmas capitate, pappilose. Drupe oblong ovoid, flattened, about 1″ long; hypocarp yellow or reddish, covering $\frac{5}{6}$ of the fruit and with a ring of ultimately caducous ferruginous hairs at the top; peduncles ·75″ long; cotyledons large, plano-convex.

Western peninsula, Konkan and N. Kanara; common in the evergreen monsoon and rain-forests of the Belgaum ghats. Fl. Jan.-Feb. Fr. May.-June.

Attains a considerable size. Trees 100' high and 3'-4' in diameter are not uncommon in the N. Kanara rain-forests. Bark smooth, thin, without any rhytidome, covered with scattered, raised, lenticular, corky cells; inner-bark reddish, hard, often fibrous. Green parenchyma soon disappearing. Wood very similar in structure to that of *H. Arhottiana*.

9. NOTHOPEGIA, Blume.

Trees. Leaves alternate or opposite, subcoriaceous or coriaceous, petioled, entire. Flowers bracteate, polygamous, small, shortly pedicelled or sessile, in axillary racemes, shorter than the leaves. Calyx 4-5-fid, persistent. Petals 4-5, imbricate, longer than the calyx, inserted at the base of the disk. Disk annular, 4-5-lobed. Stamens 4-5; filaments hairy inserted on the margin of the disk. Ovary sessile, ovoid, 1-celled; ovule pendulous from near the top of the cell; style very short; stigma indistinctly 3-lobed. Drupe fleshy, striate. Seed oblong, pendulous, testa membranous; embryo exalbuminous; cotyledons plano-convex; radicle superior.

N. Colebrookiana, Blume Mus. Bot. 1, 203; Fl. Br. I. 2, 40; Bedd. Fl. Sylv. t. 164; Cooke Fl. Pres. Bomb. 1, 280; Trimen Fl. Ceylon, 1, 325; *Glycycarpus racemosus,* Dalz. & Gibs. Bomb. Fl. 51. *Amberi,* Vern., *Sonemau,* M.; *Ambatti, ulagera, mattigar*, K.

A small tree; branches glabrous, shining; buds pilose. Leaves coriaceous, glabrous, shining above, glaucous beneath, elliptic, acuminate, 2″-8″ by 1″-2·5″; petioles ·5″ long; lateral-nerves 16 pairs, prominent beneath. Male fl. small, in axillary branched racemes, 1″-2″ long, fascicled, often 3 together along the rachis, Sepals 4, triangular, very small, rusty-pilose. Petals 4, imbricate, yellow, 4-times the calyx, slightly cinerous-hairy outside. Stamens 4 with short filaments; anthers dehiscing by longitudinal slits. Fem. fl. on shorter and less branched racemes than the male. Ovary glabrous. Fruit purple, ·5″ long, turbinate, depressed, apiculate at the top, when quite ripe the seeds are surrounded by a thin purple, sweetish pulp; before ripening the fruit is red-coloured and striated; seeds 2, planoconvex, containing a blackish-purple, viscid juice.

Western peninsula from the Konkan and N. Kanara southwards to Ceylon; common in the rain-forests of the Konkan and N. Kanara ghâts. Fl. Jan.-Mch. Fr. Mch.-May. A small or moderate-sized tree. Bark thin, brown flakey.

Wood reddish or pink, hard, compact, smooth. Pores small, uniform, single or 2 or 3 in a radial row. Medullary rays fine, somewhat irregularly together,

Fig 211. Nothopegia Colebrookiana, Blume.

white, distinct. Annual-rings fairly distinct. The narrow pale lines connecting the pores are not visible in the N. Kanara wood. Weighs about 66 lbs. to the cub. ft. An excellent little known, strong wood which merits attention.

10. SPONDIAS, Linn.

Trees. Leaves oddpinnate; leaflets usually caudate-acuminate. Flowers polygamous, small, in terminal panicles. Calyx 4-5-fid, deciduous. Petals 4-5, valvate in bud, spreading. Disk large, cupular, crenate. Stamens 8-10, inserted outside beneath the disk. Ovary free, 4-5-celled; ovules solitary, pendulous in the cells; styles 4-5, conniving above; stigmas shortly spathulate. Drupe fleshy

with a hard, spongy, woody, thick stone, 1-5-celled. Seeds pendulous; testa membranous; embryo straight; cotyledons elongate, plano-convex; radicle short, superior.

Leaflets entire, acuminate. Stone rough ... ... 1. S. mangifera.

Leaflets crenate-serrate, caudate-acuminate. Stone smooth ... ... 2. S. acuminata.

1. S. mangifera, Willd.; DC. Prodr. 2, 75; Bedd. Fl. Sylv. t. 169; Dalz. & Gibs. Bomb. Fl. Suppl. 19; Brandis For. Fl. 128; Cooke Fl. Pres. Bomb. 1, 28; Gamble Ind. Timb. 223. *Hog Plum* of Anglo-Indians. *Ambada,* M. *Amate,* K.

A small tree. Leaves 1′-1·5′ long; leaflets opposite, 3-5 pairs and a terminal one, shortly petiolulate, elliptic-oblong more or less oblique, shortly acuminate, entire; rachis cylindrical, striate; lateral-nerves numerous, parallel, with a prominent vein, running close to the edge of the leaflet; blade 2″-9″ by 1″-4″. Flowers ·25″ in diameter, white, in large, spreading panicles. Calyx minute, 5-toothed. Petals oblong, spreading. Disk broad, fleshy, toothed. Filaments subulate, shorter than the petals. Fruit ovoid, 1·5″-2″ long, yellow, smooth; stone woody, rough, fibrous and cavernous, usually with 1, less often 2-3 seeds.

Found in many parts of India and Ceylon, usually in dry forests often planted; throughout the Presidency, usually in dry forests; North Kanara from the sea-coast inland. Fl. Feb.-Apl. Fr. ripe next Nov.-Dec.

A large or moderate-sized tree, sheds its leaves early in the year. The flowers appear when the trees are quite bare, during the hot season; they are then conspicuous objects near villages both in N. Kanara and the Konkan. The fruit ripens during the next cold season. Bark smooth, grey, thick with longitudinal shallow furrows. Wood soft, light-grey, coarse-grained. Pores large, subdivided, many. Medullary rays fine and moderate-sized at irregular distances. Weighs about 30 lbs. to the cub. ft. Yields a mild, tasteless gum which exudes from wounds made in the bark. During the cold and hot seasons the fruit is greedily eaten by squirrels, monkeys and deer. The ripe fruit has an acid and astringent flavour; it is sometimes pickled. The bark is used for tanning.

2. S. acuminata, Roxb. Fl. Ind. 2, 453; Fl. Br. I. 2, 42; Cooke Fl. Pres. Bomb. 1, 281; Grah. Cat. Bomb. Pl. 42. *Ambut, ambada,* M.; *Kodambada,* K.

A moderate-sized or large tree. Leaves 1·5′-2′ long; leaflets 11-15, rather thin, membranous when dry, ovate or obovate, caudate-acuminate, distinctly crenate-serrate; rachis 4-angled, groved; lateral-nerves parallel, numerous, with a prominent intra-marginal line connecting them, parallel and close to the edge

of the leaflet; blade 2″-4″ by 1″-1·5″. Panicles terminal, rather short and compact. Fruit ovoid, 1″-1·5″; stone much smoother than in *S. mangifera.*

Western Peninsula from the Konkan southwards, found in the N. Kanara rain-forests. A moderate-sized tree, does not shed its leaves until March or April. The young leaves and panicles of flowers which are not so large or spreading as those of *S. mangifera*, appear together during March and April. Fruit ripe next Jan.-Feb. Bark rough, grey; rhytidome in broad, flat plates; inner-bark thick, red, soft, fleshy. Wood grey soft, light. Pores large simple or subdivided. Medullary rays fine or moderately broad, short. Weighs 37 lbs. to the cub. ft. The young leaves when crushed have a peculiar terebenthaceous smell. Both the species of *Spondias* are closely allied and Engler considers *S. acuminata,* Roxb. a doubtful one. Herbarium material of this latter appears however to be scarce in Europe.

Order XXXVI.—MORINGACEÆ.

Trees. Leaves alternate, bi-or tri-imparipinnate; pinnæ and leaflets opposite, entire, caducous; stipules O. Flowers bisexual, irregular, in axillary panicles Calyx cup-shaped, 5-cleft; segments unequal, petaloid. Petals 5, unequal. Stamens inserted on the edge of the disk, declinate, 5 perfect opposite the petals alternating with 5-7 filaments without anthers; anthers 1-celled. Disk lining the calyx-tube. Ovary stipitate, lanceolate, 1-celled, with 3 parietal placentas; style simple, slender; stigma undilated, perforated in the centre; ovules numerous descending, anatropous. Capsule long, pod-shaped, rostrate, 3-6-angled, torulose, 1-celled, loculicidally 3-valved, corky and pitted within. Seeds many, in pits of the valves; testa corky, winged or O; albumen O; embryo straight; cotyledons plano-convex.

This Natural Order consisting of one genus of 3 species is included by Baillon in his Hist. Nat. des Plantes amongst the *Capparidaceæ;* it has however very doubtful affinities and by most authors is considered a distinct order allied to the *Leguminosæ.*

MORINGA, LAMK.

Only genus, with characters those of the order.

Leaflets small; nerves obscure.
Petals white... ... ... 1. M. pterygosperma.

Leaflets large; nerves 4-6 pairs, distinct.
Petals streaked with pink ... ... 2. M. concanensis.

1. M. pterygosperma, Gærtn. DC. Prodr. 2, 478; Fl. Br. I. 2, 45; Brandis For. Fl. 129; Bedd. Fl. Sylv. t. 80; Dalz. & Gibs. Bomb. Fl. 314; Brandis Ind. Trees. 209; Gamble Ind. Timb. 224; Cooke Fl. Pres. Bomb. 282. *Shevgi,* M.; *Nuggi-mara,* K.; *Shivga, shegla, segata,* Vern. *Horse Raddish* or *Drumstick Tree.*

A small, unarmed tree. Leaves 20″-30″ long, usually tripinnate; leaflets caducous, about ·5″ long, ovate or obovate, obtuse, entire, pale beneath, glabrous; nervation indistinct; rachis and its branches slender, articulate, glandular at the articulations. Flowers 1″ across, irregular, white, honey-scented, in large, axillary panicles; buds ovoid, ·6″ long. Calyx-lobes slightly unequal, linear-lanceolate, outside puberulous, reflexed. Petals spathulate, imbricate; the anterior petal remains erect whilst the others are reflexed like the sepals in the open flower.

Stamens 5, fertile, alternating with 5-7 staminodes; filaments hairy at the base. Pod pendulous, 1·5′ long, 9-ribbed; seeds trigonous with winged angles.

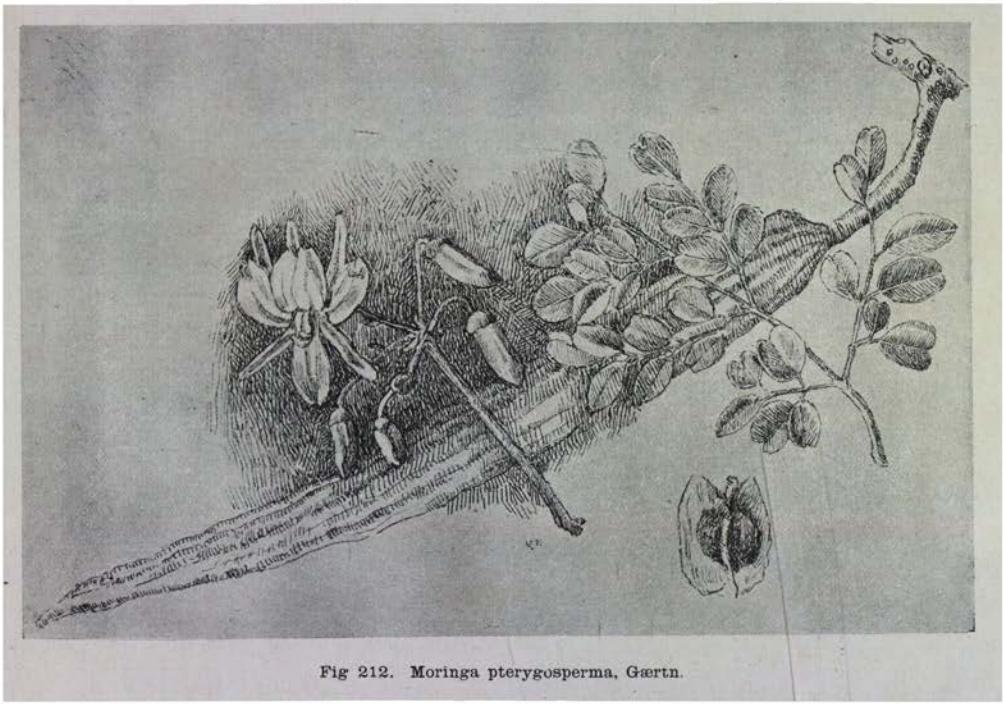


Fig 212. Moringa pterygosperma, Gærtn.

Forests of the Western Himalaya and Oudh; cultivated elsewhere throughout India. Fl. Jany.-Apl. Fr. Apl. onwards. A small tree with a straight trunk, seldom exceeding 1.5′ in diameter. Bark thick, grey, corky, with longitudinal cracks. Wood soft, white, spongy. Fruit used as a vegetable, pickled in Sind. The seeds make an excellent vegetable-curry. The root is used as a substitute for horse-radish and in medicine as a vesicant. It also yields an oil from the seeds similar to the fine machinery *Ben* oil of watchmakers and a reddish gum used in native medicine. The branches are often lopped for cattle fodder. The extensive planting of this tree and the manufacture of *Ben* oil from its seed has lately been recommended by a well informed writer on Indian forest economic products in the newspaper " Capital. "

2. M. concanensis, Nimmo in Grah. Cat. Bomb. Pl. 43; Fl. Br. I. 2, 45; Brandis For. Fl. 130; Gamble Ind. Timb. 225; Dalz. & Gibs. Bomb. Fl. 311. *Ran-Shegat,* M. *Mhua,* Sindhi.

A small tree. Leaves usually bipinnate, about 18″ long; rachis articulate,

often with stipitate glands at the articulation; leaflets 4-6 pairs, with an odd one, broadly-ovate, entire, ·25″-·5″ long; lateral-nerves 4-6 pairs, stronger than in the foregoing cultivated species. Flowers also smaller than those of *M. pterygosperma*, in lax, spreading, pubescent panicles; pedicels ·3″ long, articulated with the flowers; bracts minute, caducous. Calyx thinly tomentose; lobes oblong white, reflexed. Petals yellow with red or purple veins, oblong. Stamens 5, alternating with 4-5 staminodes; filaments hairy at the base. Capsule linear 1′-1·5′ long, acutely triquetrous, long pointed, slightly constricted between the seeds; seeds white, triangular with a thin wing at each angle.

Rajputana, Sind, S. Deccan (Kurnool and Kistna districts) and the Konkan (Thana District), rare in the Bombay Presidency. Fl. Nov.-Dec. Fr. Dec. onwards. A small tree with thick, soft, corky bark. Wood white, soft, useless as a timber. The fruit is edible.

Order XXXVII—CONNARACEÆ.

Shrubs or trees, climbing or erect. Leaves alternate, exstipulate, 1-3-foliate or odd-pinnate. Flowers regular, bisexual, in racemes or panicles. Calyx 5-divided, usually persistent, imbricate or valvate. Petals 5, usually narrow. Stamens 5-10, sometimes declinate, those opposite the petals often shorter and imperfect; filaments frequently connate at the base. Carpels usually 5, globose-ovoid, rarely more or less hairy, 1-celled; styles subulate or filiform; stigmas capitellate, simple or lobed; ovules 2, collateral. Fruit of 1, rarely 2-3, sessile or stalked, usually 1-seeded follicles. Seed arillate or not; aril various; cotyledons fleshy in the exalbuminous, leafy in the albuminous seeds; radicle superior, rarely ventral.

Calyx accrescent. Capsule sessile ... ... 1. Rourea.
Calyx not accrescent. Capsule stalked ... ... 2. Connarus.

1. ROUREA, AUBL.

Trees or sometimes climbing shrubs. Leaves alternate, odd-pinnate. Flowers small, in axillary panicles. Sepals 5, orbicular, imbricate in bud, accrescent in fruit. Petals 5. Stamens 10; filaments connate at the base. Ovaries 5, of which 4 are usually imperfect; ovules 2, collateral; styles 4-5, slender. Fruit a sessile, apiculate capsule. Seed erect, arillate, exalbuminous.

Leaflets shining, glabrous. Carpels curved, falcate, not broad at the base. ... ... 1. R. santaloides.
Leaflets dull, glabrous. Carpels ovoid not falcate, broad at the base. ... ... 2. R. Prainiana.

1. R. santaloides, W. & A. Prodr. 144; Fl. Br. I. 2, 47; Cooke Fl. Pres. Bomb. 1, 284; Trimen Fl. Ceyl. 2, 1; Bedd. Fl. Sylv. Man. t. xi. *Huleshadla-bally.* K.

A stout, climbing or scrambling, glabrous, evergreen shrub; branches often circinately twining. Leaflets often alternate, petioluled, 1-3 pairs, coriaceous, shining, elliptic, ovate, lanceolate or caudate-acuminate, acute or obtuse at the base; blade 3·5″ by 1·5″-1″; venation reticulate, strong beneath; petioles ·5″ long, often channelled. Flowers ·25″ long, white, in short fascicled, unequal, slender panicles; pedicels jointed and minutely bracteolate at the joint. Sepals ovate, orbicular, strongly imbricate, more or less ciliolate on the margins. Petals obovate, obtuse, twice as long as the sepals. Filaments 10, rarely equal, united, at the base. Ovaries 5; styles slender, as long as the ovaries, shorter than the filaments. Capsule brown, ·75″ long, curved, falcate, not broad at the base,

supported by the enlarged calyx and dehiscing along the inner suture; seeds ovoid-oblong, enclosed in an orange-coloured arillus.

Western peninsula from Bombay southwards to Ceylon, N. Kanara and Konkan ghâts but not nearly so common as the following species with which it has hitherto been confounded; closely allied to if not identical with *R. commutata,* Planch. Fl. C. S. Fr. H. & R. S.

2. R. Prainiana, Talb. sp. nov.; *R. santaloides,* Dalz. & Gibs. Bomb. Fl. 53. *Huleshadla-bally,* K.

Fig 213. Rourea Prainiana, Talb.

A stout, evergreen, climbing shrub; branches circinately climbing. Leaflets opposite or alternate, coriaceous; surface glabrous, dull, (not shining like in *R. santaloides,*) ovate, shortly, bluntly-acuminate, usually obtuse at the base; blade 2″-·75″ by 1″-·4″; petioles ·5″ long; venation strongly reticulate beneath.

Flowers small, white in short, slender, fascicled panicles or racemes; pedicels minutely bracteolate, jointed. Sepals orbicular-ovate, very obtuse, ciliate on the margins. Petals white, obovate, much longer than the sepals. Ovaries glabrous, very short; styles slender; stigmas shortly lobed at the apex. Carpels brown, glabrous, ovoid-conical, very broad at the base not at all falcate, seated on the enlarged turbinate, cup-shaped calyx, ·75″-1″ long, longitudinally striate, dehiscing upwards along the inner suture; cotyledons thick, broad, fleshy; arillus white, fleshy.

Evergreen rain and monsoon-forests of the Konkan and N. Kanara, probably all along the Malabar coast, common in the ghát forests of N. Kanara. This species has been hitherto united with *R. santaloides*, W. & A. but as pointed out by Col. Prain must be considered distinct.

Stems 2″-4″ in diameter, fluted, angular. Outer bark thin, grey, smooth, reddish within. Wood of abnormal structure, arranged in concentric cylinders of wood and bast tissue. The central cylinder about 1″ in diameter consists of reddish, tough, moderately-hard wood containing pores, small and scanty near the pith and numerous, large or very large near the outer surface of the cylinder. Medullary rays absent. The bast enclosing the wood is ·1″ thick, consisting of numerous, very thin, alternate plates of hard and soft tissue. The outer wood cylinders are divided into wedge-shaped masses of unequal size by narrow star-like rays of bast joining the concentric bast cylinders.

Western Peninsula from the Konkan to Travancore, Ceylon. In the moist monsoon-forests of the Konkan and North Kanara. Fl. Dec.-May. Fr. Feb.-July.

2. CONNARUS, L.

Trees or often scandent shrubs. Leaves odd-pinnate; leaflets usually 5, entire. Flowers small, in axillary and terminal, branched panicles. Sepals 5, not accrescent, imbricate. Petals 5, ligulate, slightly dilated upwards. Stamens 10, five shorter and sometimes without anthers; filaments connate, dilated at the base. Ovaries 5, densely pubescent; 4 usually imperfect or obsolete; the fifth with a slender style; stigma capitellate. Follicles oblique, stipitate, inflated, broader upwards; valves glabrous or pubescent within; seeds arillate; testa shining; albumen O; cotyledons amygdaloid.

Follicles narrow, turgid, neither striate nor shining, gradually contracted into a stalk ... ... 1. C. monocarpus.

Follicles shining, striate, shortly narrowed into a stalk; ventral suture straight ... ... 2. C. Wightii.

Follicles shining, striate, suddenly contracted into a stalk; ventral suture curved ... ... 3. C. Ritchiei.

C. monocarpus, Linn , Fl. Br. I. 2, 50; Cooke Fl. Pres. Bomb. 1, 284; Brandis Ind. Trees 211; Trimen Fl. Ceyl. 2, 2; *C. pinnatus,* Lamk.; W. & A. Prodr. 143; Grah. Cat. Bo. Pl. 35; Dalz. & Gibs. Bomb. Fl. 53. *Sundar,* M.

A much branched, bushy shrub; young parts rusty-puberulous. Leaflets 1-2 pairs with a terminal one, glabrous, shining, elliptic or elliptic-lanceolate, obtusely acuminate, rounded or acute at the base; blade 3″-4″ by 1·25″ 1.75″; lateral-nerves 3-5 pairs; petioles 2″-3″ long; petiolules swollen, channelled, ·25″ long, of the terminal leaflet longer. Flowers about ·25″ long, articulated on short rusty pubescent pedicels, densely crowded in erect pubescent pyramidal, paniculate cymes. Sepals oblong acute, densely pubescent. Petals longer than the calyx, linear oblong, more or less pubescent outside. Follicles glabrous, scarlet, turning dark-brown, 1·5″-2.25″, fusiform, apiculate, slightly falcate, tapering into a narrow stalk, surrounded at the base by the non-accrescent calyx, smooth, neither striate nor shining; seeds ovoid, compressed, 1″ long; arillus basal, yellow; testa black, shining.

From the Konkan to Travancore; common in the dry parts of Ceylon, I have never found *C. monocarpus,* L. in the forests of the Bombay presidency. There is I think good reason to doubt whether the "*Sundar*" referred to in Dalz. & Gibs. Bombay Flora p. 53 as "common on the Southern Ghâts" is really this species.

2. C. Wightii, Hook. f.; Fl. Br. I. 2, 51; Cooke Fl. Pres. Bomb. 1, 285; Brandis Ind. Trees 212. *Kokani, kutkuta,* M.

An erect or climbing shrub. Leaves 3-5-foliate; leaflets ovate or elliptic abruptly-acuminate, acute at base, glabrous, shining; blade 5″-2·5″ by 2″-1·5″; lateral-nerves about 6 pairs, arched and slender. Flowers yellow-white, in large, terminal, pyramidal, rusty-pubescent, dense-flowered panicles, 8″-10″ in diameter. Follicles 1-seeded, compressed, pointed at tips, pink and yellow, turning dull chestnut-brown, strongly striate, narrowly keeled on the dorsal suture; seeds obovoid-oblong; arillus basal, yellow, furrowed, fleshy; testa black, shining.

Western Peninsula from the Konkan southwards in evergreen monsoon and rain-forests.

3. Ritchiei, Hook. f.; Fl. Br. I. 2, 51; Cooke Fl. Pres. Bomb. 1, 285; Brandis Ind. Trees 212.

A much-branched, bushy shrub about 6′ high or a climber. Leaves 5-foliate; leaflets elliptic-lanceolate, acute or shortly acuminate, rounded at the base; reticulated, glabrous, shining above and beneath; lateral-nerves about 6 pairs; blade 3″-1·25″ by 1·5″-·5″; petiolules ·25″ long, channelled. Flowers yellow-white (similar to those of *C. Wightii,*) in dense terminal, pubescent panicles. Follicles 1-2-seeded, oblong, turgid, ·75″ long by ·5″ thick, usually obtusely rounded at the apex and somewhat cordate or intruded at the base, yellowish-pink, turning pale-

brown and glabrous, shining, striate, differs from that of *C. Wightii,* in having a convex ventral and a strongly ridged dorsal suture also a turgid, sometimes cordate base; seeds and arillus similar to those of *C. Wightii.* Both plants are very closely allied and in my opinion should be reduced to varieties of the same species.

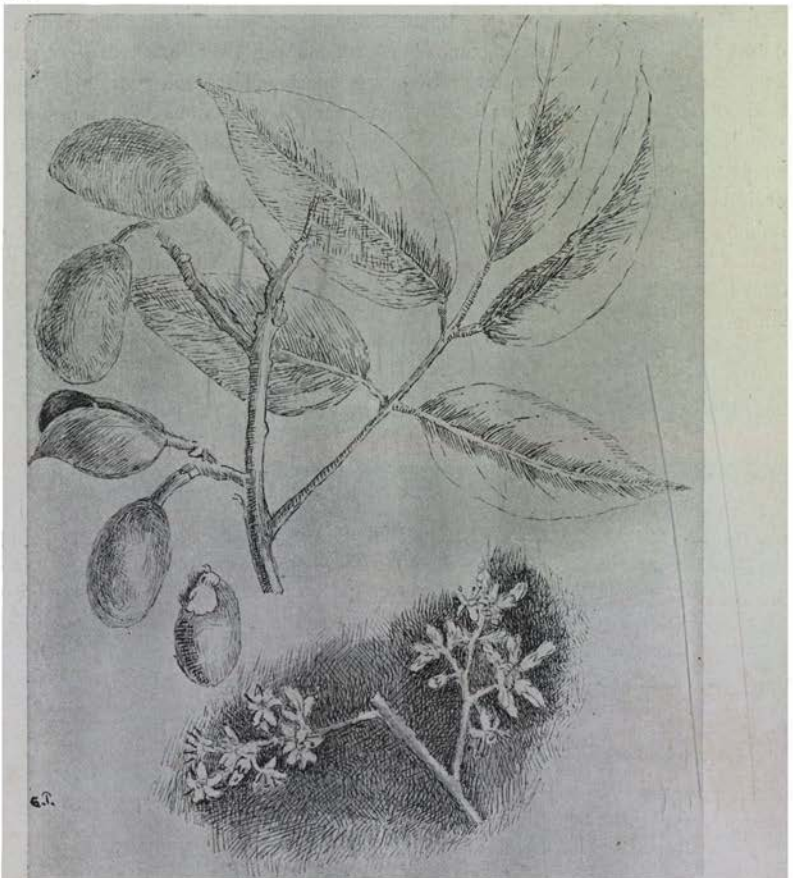


Fig 214. Connarus Ritchiei, Hook, f.

Western ghâts of the Konkan, N. Kanara and Belgaum districts, in evergreen monsoon and rain-forest; very common on the Ram ghàt.

An immense climber with stems about 4″ in diameter at the base, sometimes an erect shrub. Bark smooth, lenticellate, ·25″ thick; inner-bark very red with much red juice like that of *Myristica attenuata.*

Both the above species flower abundantly from Feb-Apl. Fr. May-June.

Order XXXVIII—LEGUMINOSÆ.

Herbs, shrubs or trees. Leaves usually alternate, stipulate; simple or compound. Inflorescence racemose or panicled. Flowers bracteate, regular or irregular, usually hermaphrodite. Sepals 5, combined or free. Petals 5. Stamens normally 10 or numerous, perigynous or nearly hypogynous; filaments free or combined; anthers 2-celled. Ovary free, consisting of a single carpel; style simple; ovules 1 or more on the ventral suture. Fruit a pod, variously dehiscent or indehiscent. Seeds usually exalbuminous; cotyledons foliaceous or amygdaloid; radicle short, straight or inflexed, accumbent.

A large Order of great importance to the forester, yielding as it does many excellent timbers and other valuable commercial products; it is divided into 3 sub-orders as follows:—

Sub-Order I.—Papilionaceæ.

Leaves alternate, digitate or pinnate, rarely 1-foliate. Calyx gamosepalous, 5-toothed or lobed, often 2-lipped. Corolla papilionaceous. Petals irregular, imbricated; the upper or posterior (standard) outermost; the 4 others in opposite pairs, the two lateral or wings and the two lowermost, inside the wings, usually cohering by their lower margins, constitute the keel. Stamens definite, usually 10, inserted with the petals or on the edge of a disk lining the lower part of the calyx-tube; filaments all connate into one sheath (monadelphous), in two bundles of 5 each or 9 in one bundle and 1 separate (diadelphous) or all ten filaments free. Ovary free. Seeds with a coriaceous testa; cotyledons with the radicle accumbent on them.

TRIBE I.—*Genisteæ*. Leaves simple or digitately 3-5-foliate. Stamens monadelphous. Pod dehiscent, not jointed.

Anthers dimorphous. Pod inflated ... ... 1. Crotalaria.

TRIBE II.—*Galegeæ*. Stamens diadelphous. Pod dehiscent, not jointed. Leaves imparipinnate; leaflets entire.

Anthers apiculate; hairs fixed by the centre. Shrubs 2. Indigofera.

Anthers obtuse; hairs basifixed.

Pod few-seeded.

All filaments filiform. Climbers ... ... 3. Millettia.

Alternate filaments dilated. Trees ... ... 4. Mundulea.
Pod many-seeded.
Herbs or undershrubs ... ... 5. Tephrosia.
Trees ... ... 6. Sesbania.

TRIBE III.—*Hedysareæ*. Stamens diadelphous or monadelphous. Pod jointed if more than 1-seeded. Leaves oddpinnate.

Leaflets exstipellate.
Stamens monadelphous ; anthers uniform.
Leaflets 1-3 ... ... 7. Taverniera.
Stamens diadelphous, (9-1); anthers uniform.
Leaves simple ... ... 8. Alhagi.
Stamens monadelphous ; anthers dimorphous.
Leaves pinnately trifoliate ... ... 9. Stylosanthes.
Leaflets stipellate.
Racemes in fascicles from the old wood ... 10. Ougeinia.
Racemes simple or panicled from the year's shoots ... ... 11. Desmodium.

TRIBE IV.—*Viciæ*. Stamens diadelphous (the tenth abortive in *Abrus*). Pod dehiscent, not jointed. Leaves equally pinnate ; petioles ending in a bristle or tendril.

Stamens 9. Leaflets numerous ... ... 12. Abrus.

TRIBE V. *Phaseoleæ*.—Stamens monadelphous or diadelphous. Pod dehiscent, not jointed. Leaves usually pinnately trifoliate, stipellate. Usually climbers.

Leaves not gland-dotted.
Pod usually several-seeded, not samaroid.
Petals very unequal.
Keel longest. Anthers dimorphous. Climbers with irritating bristles ... ... 13. Mucuna.
Standard longest. Anthers uniform. Prickly trees ... ... 14. Erythrina.
Petals equal.
Calyx 2-lipped, glabrous. Glabrous climbers 15. Canavalia.
Calyx campanulate, not lipped, silky. Pubescent climbers ... ... 16. Pueraria.

Pod 1-seeded, like a reversed samara.
Flowers small, panicled.
Large climbers ... ... 17. Spatholobus.
Flowers large, racemose.
Erect tree or climbers ... ... 18. Butea.
Leaves gland-dotted beneath.
Ovules 3 or more.
Seeds with a large strophiole ... ... 19. Atylosia.
Seeds with a small strophiole ... ... 20. Dunbaria.
Ovules 1-2.
Calyx-teeth accrescent ... ... 21. Cylista.
Calyx-teeth not accrescent.
Leaves pinnate ... ... 22. Rynchosia.
Leaves digitately trifoliate or simple ... 23. Flemingia.

TRIBE VI. *Dalbergieæ.*—Stamens monadelphous or diadelphous. Pod continuous, indehiscent.
Leaves imparipinnate.
Leaflets alternate.
Flowers small, usually white ... ... 24. Dalbergia.
Flowers larger, yellow ... ... 25. Pterocarpus.
Leaflets opposite.
Pod compressed, not winged ... ... 26. Pongamia.
Pod thin, winged ... ... 27. Derris.

TRIBE VII.—*Sophoreæ.*—Stamens free. Pod not jointed. Leaves oddpinnate, rarely simple. Pod moniliform ... ... 28. Sophora.

Sub-Order II.—Cæsalpinieæ.

Usually trees or shrubs. Leaves 1-2-pinnate, trifoliate, rarely simple; leaflets usually many; stipels mostly absent. Flowers irregular or rarely regular, often zygomorphic, usually hermaphrodite. Calyx of 5 more or less connate sepals, the short tube often lined by a thin disk, bearing the petals and stamens. Petals 5, imbricate in bud, the upper inside in bud. Stamens 10 or fewer, rarely numerous; filaments connate, free and often unequal. Pod dehiscent or indehiscent; seeds albuminous or exalbuminous; radicle straight.

TRIBE I. *Eucæsalpinieæ.*—Leaves ample, abruptly bipinnate. Calyx-disk sub-basal.
Sepals imbricate.

Sutures of pod not winged ... ... 29. Cæsalpinia.
Dorsal suture only of pod winged ... ... 30. Mezoneuron.
Sepals valvate.
Unarmed trees. Pod thin, flat ... ... 31. Poinciana.
Spinous tree. Pod turgid ... ... 32. Parkinsonia.
Prickly climber. Pod sub-torulose ... ... 33. Wagatea.

TRIBE II. *Cassieæ*.—Leaves simply pinnate. Calyx-tube short; disk sub-basal.

Petals 5.
Pod variable, terete or flat; usually many-seeded ... ... 34. Cassia.
Pod thick, turgid, 1-seeded ... ... 35. Cynometra.
Petals O.
Pod samaroid, 1-seeded ... ... 36. Hardwickia.

TRIBE III. *Amherstieæ*.—Leaves equally pinnate. Calyx-disk at the top of a prolonged calyx-tube.
Petals O ... ... 37. Saraca.
Petals 3-5 ... ... 38. Tamarindus.

TRIBE IV. *Bauhinieæ*.—Leaves simple, more or less 2-lobed ... ... 39. Bauhinia.

Sub-Order III.—Mimoseæ.

Trees, shrubs or climbers, rarely herbs. Leaves abruptly bipinnate, rarely simply pinnate. Flowers usually sessile, small, 5-merous, regular, in globose heads or cylindrical spikes, rarely in slender racemes or globose umbels. Sepals valvate, generally connate into a 5-toothed calyx. Petals valvate, as many as the sepals, hypogynous, often connate into a lobed corolla. Stamens hypogynous, indefinite or definite, usually exserted; anthers dehiscing longitudinally. Ovary free in the bottom of the calyx. Seeds without albumen; embryo straight; radicle short.

TRIBE I. *Mimoseæ*.—Stamens usually 10.
Anthers gland-crested.
Flowers in globose heads.
A tree ... ... 40. Xylia.
Flowers in slender spikes.
A climber with tendrils ... ... 41. Entada.
An erect, unarmed tree ... ... 42. Adenanthera.

Prickly trees. Pod turgid ... ... 43. Prosopis.
Spinous trees. Pod thin ... ... 44. Dichrostachys.
Anthers not gland-crested.
Pod continuous ... ... 45. Leucæna.
Pod jointed ... ... 46. Mimosa.

TRIBE II. *Acacieæ*.—Stamens indefinite.

Stamens free ... ... 47. Acacia.
Stamens monadelphous.
Pod thin, ligulate ... ... 48. Albizzia.
Pod circinate ... ... 49. Pithecolobium.

1. CROTALARIA, LINN.

Herbs or shrubs. Leaves simple or very rarely 3-5-foliate. Flowers in terminal or leaf-opposed racemes, often showy. Calyx with a short campanulate tube; teeth free or somwhat connate into 2 lips. Corolla usually yellow, included or exserted; keel incurved, distinctly beaked. Stamens monadelphous in a sheath, split dorsally; anthers dimorphous, alternately on short filaments versatile and on longer basifixed. Ovary usually sessile; style long, abruptly incurved at the base, bearded above; stigma oblique, small. Pod usually sessile, turgid or inflated, continuous within, 2-many seeded.

Leaves simple.
A firm-branched under-shrub with rigid, small, exstipulate, deciduous, scattered leaves. Pod oblong, slightly exserted ... ... 1. C. Burhia.
Shrubs with silky or pubescent foliage.
Racemes or panicles, mostly terminal. Pods glabrous, exserted.
Stipules and bracts subulate ... ... 2. C. retusa.
Stipules and bracts foliaceous ... ... 3. C. sericea.
Flowers racemed.
Branches slender, terete, striate.
Leaves broad-ovate. Corolla pale-yellow or white with blue markings ... . 4. C. Heyneana.
Leaves linear. Corolla bright-yellow ... 5. C. juncea.
Branches quadrangular, channelled ... ... 6. C. leptostachya.
Flowers panicled.
Pod small, brown, silky, included ... ... 7. C. fulva.
Leaves trifoliate.
Undershrub. Pod glabrous, exserted ... ... 8. C. striata.

Many species of *Crotalaria* are scattered throughout the undergrowth in our forests; *C. retusa* and *C. fulva* are the largest and most important of these: *C. dubia*, *C. leptostachya* and *C. lutescens*, confined to limited areas of distribution are probably endemic in the Bombay Presidency.

1. C. Burhia, Hamilt. in Wall. Cat. 5386; Fl. Br. I. 2, 66; Brandis For. Fl. 144; Dalz. & Gibs. 54; Cooke Fl. Pres. Bomb. 1, 292. *Ghagri,* M.; *Ghugharo,* Guz.; *Drunnu,* Sind.; *Sis, sissai,* Vern.

A low slender-branched under-shrub; branches stiff and rigid when old, covered with pale-grey tomentum. Leaves deciduous, scattered, small, ovate, linear or oblong, acute, ·3″ long; stipules O. Flowers small, scattered on the long terminal paniculate racemes; pedicels short with 2 deciduous bracteoles. Calyx ·25″ long, deeply lipped; teeth lanceolate, acute, densely silky-hairy. Corolla scarcely exserted, yellow with red veins. Pod 3-4-seeded, nearly globose, hairy, slightly exserted.

Punjab, Rajputana and Cambay ascending to 4000′; common in the plains of Sind in dry sandy places; in Guzerat near Ahmedabad. Fl. Nov.-Mch. A desert species, browsed by cattle. Yields a fibre suitable for cordage.

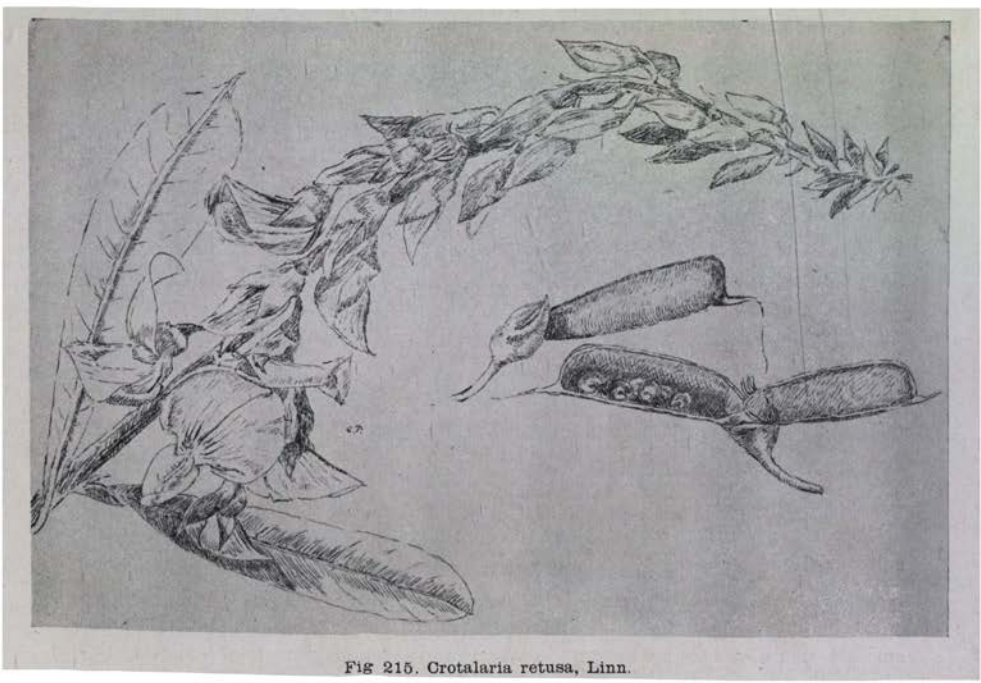


Fig 215. Crotalaria retusa, Linn.

2. C. retusa, L.; Fl. Br. I. 2, 75; Cooke Fl. Pres. Bomb. 1, 298; *C. Leschenaultii*, (not of DC.); Grah. Cat. 44; Dalz. & Gibs. Bomb. Fl. 54. *Gagri, dyli, dingala*, M.

A robust, stout-branched under-shrub. Leaves oblanceolate, entire, mucronate, pellucid-dotted; blade 5″-3″ by 1″-·6″; upper surface glabrous; underneath densely grey-silky tomentose; lateral-nerves parallel, rather distant, scarcely curved upwards; stipules subulate, very minute, not deciduous. Flowers in terminal racemes, each about 28-flowered; buds ovoid, acute, deflexed, nearly glabrous; lower pedicelled; pedicels longer than the calyx; bracts subulate, 1 at the base of each pedicel and 2 subulate bracteoles near the middle of the pedicels. Calyx ·5″ long; tube campanulate, glabrous or nearly so; teeth lanceolate. Corolla exserted, yellow, tinged with purple. Pod linear, stalked, glabrous, crowned with the persistent style, 15-20- seeded.

Tropical India from the Himalayas to Ceylon. Fl. and Fr. Sept.-Oct.

A robust under-shrub, 15′-20′ high, common on the Panchgani and Mahableshwar plateaux. A conspicuously handsome plant flowering during October when it is sometimes called the "Glory of Mahableshawar." *C. Leschenaultii*, DC. is found on the Nilghiris and other hills of Southern India.

3. C. sericea, Retz. Fl. Br. I. 2, 75; Cooke Fl. Pres. Bomb. 1, 299.

A tall, glabrous, branched under-shrub; branches angular, sulcate, ascending. Leaves oblanceolate, mucronate, glabrous above, finely silky beneath, cuneate at the base; blade 2″-6″ long of variable breadth; lateral-nerves parallel, stronger than but not so numerous as in the foregoing species; stipules leafy, persistent. Flowers in long, lax racemes; one large leafy, ovate-acute, cordate bract at the base of each pedicel and 2 minute subulate bracteoles below the middle of the pedicel. Calyx tubular-campanulate, ·5″ long; 2 upper teeth triangular, acute; 3 lower smaller, linear-lanceolate, acute. Corolla much exserted yellowish-purple. Pod glabrous, linear-oblong, 1″-2″ long, distinctly stalked; seeds 20-30.

Throughout India, Malay peninsula and the Andamans, apparently absent from Ceylon; cultivated in Punjab gardens; common in the deciduous monsoon-forests of N. Kanara and the Konkan. Fl. & Fr. C. S. Closely allied to but easily distinguished from *C. retusa*, Linn. by the persistent foliaceous bracts and stipules.

4. C. Heyneana, Grah. in Wall. Cat. 5414; Fl. Br. I. 2, 78; Cooke Fl. Pres. Bomb. 1, 300.

An under-shrub; branches pubescent, woody, slender. Leaves broad, ovate, sub-rhomboid, narrowed at both ends, acute or acuminate, membranous; blade 3″-5″ by 1·8″-2″; underside paler than the upper; lateral-nerves very distinct, 7 or 8 pairs, looping within the margin; petioles very short or O; stipules small, ½-lunate, reflexed. Flowers in lateral and terminal racemes; pedicels ·25″-

5″ long; bracts linear-subulate. Calyx ·5″ long, pubescent in the long acute, deflexed buds, glabrescent when old; tube campanulate; teeth lanceolate. Corolla ·75″ long, exserted, pale-yellow or white with blue streaks at the base. Pods oblong, hairy, 1·5″ long, 10-12-seeded.

An under-shrub in the ghát evergreen monsoon and rain-forests of the Western Peninsula from the Konkan to Travancore. A very distinct species.

5. C. juncea, L.; Fl. Br. I. 2, 79; *C. tenuifolia,* Roxb. Fl. Ind. 546. *Santaag,* Bomb.; *Sini, tagsam,* Sind; *Sanabu, pundi,* K.; *Suna* or *Indian Hemp; Bombay* or *Salsette Hemp.*

A stiff shrub, several feet high; branches long, slender, terete, ascending. Leaves firm, distant, linear or oblong, 1·5″-3″ by ·25″-·5″, obtuse or subacute, clothed on both sides with brown silky hairs. Flowers in terminal or lateral racemes; bracts minute linear. Calyx ·5″ long, densely ferruginous-hairy; teeth long. Corolla bright-yellow, slightly exserted. Pod about 1″ long, clothed with dark-brown silky hairs, 10-15-seeded.

Doubtfully indigenous in India; cultivated throughout North Kanara also in the Deccan, Konkan and Sind, sometimes well established, growing as it does in the long grass with *Labiatæ, Umbelliferæ* etc. on the Toranmal plateau of the Khandesh Akrani. Yields a valuable fibre, made into cordage, coarse cloth and paper.

6. C. leptostachya, Benth. in Hook. Lond. Journ. Bot. 2, 562; Fl. Br. I. 2, 78; Cooke Fl. Pres. Bomb. 1, 300.

An erect shrub with a few lateral branches; stems 4-angled, sulcate on the sides and silky-pubescent on the angles. Leaves thin, 3·5″-5″ by ·25″-1″, lanceolate or linear-oblong, very acute, brown-silky pubescent on both sides; petioles short; stipules minute, caducous. Racemes laxly 10-20-flowered, 6″-12″ long; pedicels short, pubescent; bracts minute, subulate. Calyx ·25″ long, densely silky; tube very short; teeth triangular, linear-acute. Corolla yellow, included. Pod oblong, sessile, 4-6-seeded, ·6″-·75″ long, densely tomentose.

Konkan and N. Kanara; apparently endemic in the monsoon-forests along the ghâts of the Bombay Presidency.

7. C. fulva, Roxb. Fl. Br. I. 2, 80; Cooke Fl. Pres. Bomb. 1, 301.

A stout, erect, much-branched shrub, 5′-6′ high; stems sometimes thick at the base; branches densely clothed with short, brown silky hairs. Leaves ovate, cuspidate, subcoriaceous, densely silky-tomentose; blade 4″-2·5″ by 1″-·7″; lateral-nerves distinct beneath, about 8 pairs; stipules minute. Flowers in large panicled racemes; bracts ovate, nerved, cuspidate, reflexed. Calyx foliaceous, densely brown-silky, with a pair of persistent bracteoles at the base. Corolla

slightly exserted; standard densely-silky, about 1″ long. Pod included in the calyx, thinly-silky, 2-seeded.

Western Peninsula, in the ghât evergreen monsoon and rain-forest from the Konkan southwards. A tall, bushy shrub, densely clothed with brown-silky hairs, abundant along the ghâts of North Kanara. A distinct and easily recognised forest-species. Fl. and Fr. C. S.

8. C. striata, DC. Prodr. 2, 131; Fl. Br. I. 2, 84; Cooke Fl. Pres. Bomb. 1, 303.

An erect shrub; branches sulcate, thinly-silky. Leaves trifoliate; leaflets obovate, oblong, acute, 5″-2·5″ by 3·5″-1·3″, glabrous, membranous; stipules minute, setaceous; petioles about ·3″ long; petiolules thick, ·1″ long. Flowers in long, terminal and lateral racemes. Calyx thinly-silky, ·25″ long; teeth as long as the tube, lanceolate. Corolla twice the calyx, yellow, striped with red. Pods 1·25″ long, deflexed, somewhat recurved, thinly-silky; seeds about 20.

Himalayas to Ceylon and Malacca; common in open places near Sirsi, North Kanara; also in the Deccan. Fl. and Fr. C. S. Scarcely a forest species.

2. INDIGOFERA, Linn.

Herbs or shrubs, more or less clothed with hairs fixed by the centre, often silvery-canescent. Leaves odd-pinnate, rarely simple; stipules usually small, setaceous. Flowers small pedicelled, bracteate, in axillary racemes. Calyx campanulate, small. Corolla with an obovate standard and a straight keel spurred on each side near the base. Stamens diadelphous; anthers apiculate. Ovary sessile; ovules many; style short, incurved; stigma capitate, usually penicillate. Pod usually linear, cylindrical, more or less turgid and septate between the seeds.

Leaflets 3-5, alternate.

Pod 6-8-seeded, curved, glaucous, torulose ... ... 1. I. paucifolia.

Leaflets many, opposite.

Flowers small.

Pod torulose, cylindric, silvery-hairy, 3-4-seeded... 2. I. Houer.

Pod not torulose, cylindric, glabrous, 8-12-seeded.. 3. I. tinctoria.

Pod torulose, tetraquetrous, 4-6-seeded ... ... 4. I. constricta.

Flowers larger.

Pod turgid, cylindric, glabrous, 8-12-seeded ... 5. I. pulchella.

1. I. paucifolia, Delile; DC. Prodr. 2, 224; Fl. Br. I. 2, 97; Dalz. & Gibs. Bomb. Fl. 59; Trimen Fl. Ceylon 2, 25; Cooke Fl. Pres. Bomb. 1, 313.

A stout, woody branched shrub with white-silvery pubescence. Leaves

imparipinnate silvery-canescent; petioles ·25″-·5″ long; leaflets 3-5, alternate, coriaceous, ovate or obovate, ·75″-1″ by ·25″-·5″; petiolules distinct. Racemes axillary, slender, about 20-flowered. Calyx silvery, very small, ·005″ long. Corolla red, 3-4-times the calyx. Pod recurved, torulose obtusely tetragonous, glaucous, rather slender, about ·75″ long.

Upper Gangetic basin, Arabia, Tropical Africa and Java; throughout the dry plains of the presidency and Sind. A shrub 3′-6′ high. Fl. & Fr. Sept.-Oct.

2. I. Houer, Forsk. Fl. Egypt-Arab. (1775); Cooke Fl. Pres. Bomb. 1, 318; *I. argentea,* Linn.; DC. Prodr. 2, 224; Fl. Br. I. 2, 98; Var. *cærulea,*; *I. cærulea,* Roxb. Fl. I. 3, 377; Dalz. & Gibs. Bomb. Fl. 59; Brandis For. Fl. 136. Often called *Wild Indigo; Karu-nili,* K.

A densely silvery-pubescent shrub with angled, striate, woody, branches. Leaves 2″-3″ long; leaflets opposite, 7-11, persistently silvery-white, obovate, ·5″-1″ long. Racemes short, densely flowered. Calyx very small, ·005″ long; teeth cuspidate. Corolla reddish-yellow, ·20″ long. Pod ·4″ long, thick, turgid, recurved, mucronate, silvery-hairy when young, afterwards glabrescent; somewhat constricted between the seeds, 1-several-seeded.

Burma, Merwara and Sind; wild in the hills of Beluchistan and in Southern India; wild and cultivated in Egypt, Arabia and the Barbary states; common in the dry plains of the Dharwar district and generally throughout the dry districts of the Bombay Presidency. Fl. June. Fr. Aug-Sept. An erect shrub about 3′ high. Roxburgh (l. c.) says he has extracted a beautiful light and better *Indigo* from *I. Houer,* than that obtained from *I. tinctoria.*

2. I. tinctoria, Linn.; DC. Prodr. 2, 224; Fl. Br. I. 2, 99; Dalz. & Gibs. Bomb. Fl. 59; Brandis For. Fl. 135; *I. sumatrana,* Gærtn. Fruct. 2, 317, t. 148. *The Indigo Plant. Nil,* Vern.; *Nili,* M.; *Guli,* Guz.; *Jil, nir,* Sind.

A low, woody branched, thinly adpressed silvery-hairy, shrub. Leaves 1·5″-3″ long; stipules small, linear-cuspidate; leaflets 9-13, opposite, thin, sparsely hairy beneath, turning black when dry, ovate or obovate about ·75″ long; petioles ·5″ long. Racemes sessile, 2″-4″ long. Calyx minute, silvery. Corolla reddish-yellow, ·20″ long. Pod slender, ·75″-·25″ long, acute, glabrescent; seeds about 10.

In open places near villages throughout the Konkan and North Kanara, Belgaum, etc., doubtfully indigenous; cultivated in Sind and Guzerath. Fl. and Fr. Oct.-Jan. Yields the valuable *Indigo* dye, which has been supplied to commerce from India from time immemorial.

4. I. constricta, Trim. Cat. Ceyl. Pl. 23; Cooke Fl. Pres. Bomb. 1, 319; *I. flaccida,* var. *constricta,* Thw. Enum. 411; Fl. Br. I. 2, 99. Ceylon (Thwaites).

A much branched, thinly silvery-canescent shrub about 5′-6′ high. Foliage much ressembling that of the *Indigo* plant but scarcely drying black; stipules

minute, subulate. Leaves 2″ long; leaflets 7-11, dark-green above, glaucous beneath, 1″-·75″ by ·25″-·5″. Racemes slender, axillary, about 4″ long and 20-30-flowered; bracteoles linear, ovate, as long as the flowers, deciduous. Calyx campanulate, ·15″ long, thinly silvery-hairy; teeth short, acute. Corolla ·4″ long, pink. Pod thinly adpressed white-hairy, slender, curved, tetraquetrous and torulose, 1″-1·75″ long, 3-6-seeded.

Fig 216. Indigofera constricta, Trim.

In the moist forests of North Kanara; common on the Supa ghâts. Fl. Oct. Nov. Fr. Dec.-Jan. A handsome bushy shrub similar in habit to *I. pulchella*.

5. I. pulchella, Roxb. Hort. Beng. 57; Fl. Ind. 3, 382; Fl. Br. I. 2, 101; Dalz. & Gibs. Bomb. Fl. 60; Bedd. Fl. Sylv. 85; Cooke Fl. Pres. Bomb. 1, 320. *Chimnati*, Vern.

A large much-branched, handsome shrub about 5′ high; branches sulcate, angular, thinly grey-hairy at first, afterwards glabrescent or brown-hairy, hispidulous. Leaves 6″ long with about 10 pairs of obovate-oblong, mucronate leaflets, each about ·75″ long; stipules minute, subulate, caducous. Flowers in short peduncled, 1″-3″ long racemes; bracts longer than buds, acute, early dehiscent. Calyx ·1″ long, silvery-hairy; teeth short. Corolla about ·75″ long, bright-red. Pod straight, 1·5″ long, turgid with a thickened suture; seeds about 10. A common forest species with comparatively large flowers.

Throughout the Himalayas and hills of India proper, ascending to 5000′, in Kumaun, Burmah; throughout the Konkan and North Kanara from the sea-level upwards, usually in moist evergreen and deciduous monsoon-forests along the

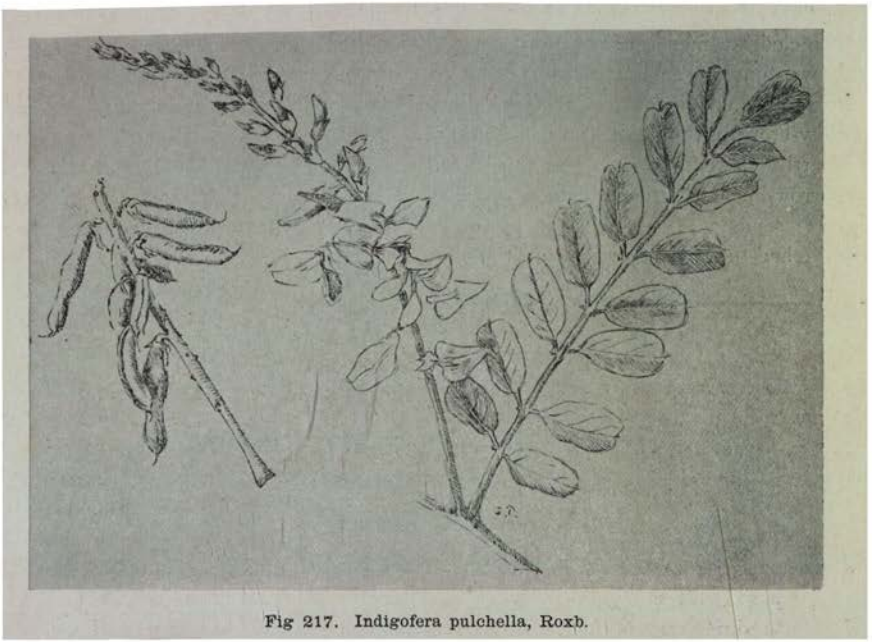


Fig 217. Indigofera pulchella, Roxb.

ghâts; common on the table land at Mahableshwar on laterite; sometimes gregarious. Fl. Oct.-Jan. Fr. ripe Feb.-Mch.

3. MILLETTIA, Wgt. & Arn.

Usually climbing shrubs. Leaves imparipinnate. Flowers showy, in axillary or terminal racemes or panicles. Calyx campanulate with short teeth. Corolla much exserted, with long-clawed petals and a broad standard; keel not beaked. Stamens monadelphous or diadelphous with filiform filaments and uniform anthers. Style filiform, incurved, glabrous with a capitate stigma. Pod few-seeded, turgid, sometimes torulose, tardily or scarcely dehiscent.

M. racemosa, Benth. Pl. Jung. 249; Fl. Br. I. 2, 105; Gamble Ind. Timb. 233; Cooke Fl. Pres. Bomb. 1, 322; *Wisteria pallida,* Dalz. & Gibs. Bomb. Fl. 61; *W. racemosa,* Dalz. & Gibs. Bomb. Fl. 61.

A large climbing shrub with glabrous or thinly-silky branches. Leaves stipulate, about 1′ long, imparipinnate, with 5 pairs of stipellate leaflets; stipules and stipels setaceous; leaflets opposite, membranous, obovate, abruptly-acuminate, glabrous, shining above, downy, pale, beneath, 2″-3·5″ by 1″-2·8″; petioles of lateral

leaflets about ·1″ long. Flowers close, not fascicled, in axillary, bracteate, panicled racemes; each about 3″ long; panicles shorter than the leaves, densely brown-tomentose; bracts twice as long as the buds, setaceous, densely brown-tomentose, deciduous. Calyx ·15″ long, campanulate; teeth deltoid, densely silky-brown without. Corolla ·5″ long, red or purple, very deciduous; standard shortly clawed. Ovary glabrous, shortly stalked; ovules 6. Pods 6″ long, narrow-linear, flattened between the seeds, coriaceous, glabrous, black when ripe; seeds 3-4; the inner coat of the pod, which is late in dehiscing, remains attached to the seeds which are thus falsely winged.

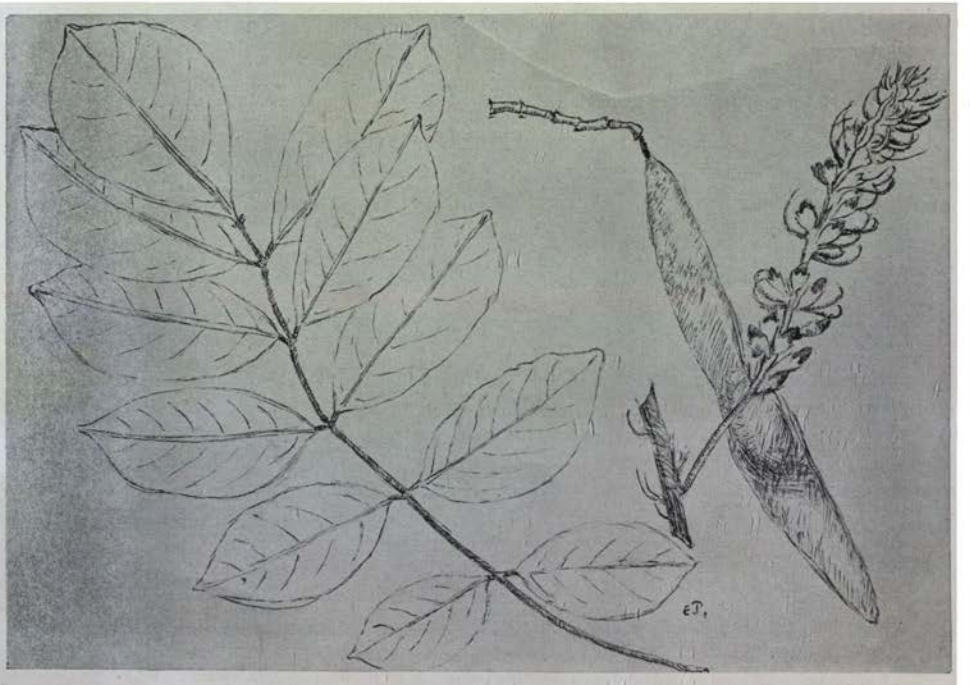


Fig 218. Millettia racemosa, Benth.

Tropical forests of the Western peninsula from the Konkan southwards, Orissa; throughout the deciduous monsoon-forests of the Konkan and North Kanara. Fl. Apl.-May. Fr. ripe next cold season. A large, woody climber with red flowers. Pod late in dehiscing and breaking up into 1-seeded articles. "Wood light-brown, red in the centre, hard with patches of loose tissue which anastomose cross-wise." Gamble.

4. MUNDULEA, DC.

A small tree or shrub. Leaves imparipinnate; stipules small. Flowers in dense, terminal racemes. Calyx campanulate; teeth short, two upper connate. Corolla much exserted; standard with a long claw; wings falcate; keel oblong, incurved, obtusely pointed. Stamens monadelphous; alternate filaments slightly dilated; anthers uniform. Style filiform; stigma capitate. Pod scarcely dehiscent, flat, linear, with thickened sutures, few-seeded; seeds reniform.

M. suberosa, Benth. Pl. Jung. 248; Fl. Br. I. 2, 110; Bedd. Fl. Sylv. 85; Cooke Fl. Pres. Bomb. 1, 322; Gamble Ind. Timb. 233; Trimen Fl. Ceyl. 2, 29; *Tephrosia suberosa*, Dalz. & Gibs. Bomb. Fl. 60. *Supti*, Vern.; *Menbundati*, K.

Branches, leaves beneath, pods etc. densely grey-tomentose. Leaves 4″-6″ long with 6 to 11 pairs of opposite, shortly petioluled leaflets; leaflets 1·75″-·5″ by ·6″-·25″, oblong or ovate, lanceolate, coriaceous, bright-green above, silvery-silky beneath; petioles ·5″-·75″ long. Flowers large, showy, in terminal racemes; pedicels ·6″ long. Calyx small, campanulate, ·8″ long; segments broadly triangular, acute. Corolla about 1″ long; standard pilose, reddish-violet, silvery outside. Pod flat, 4″ long by ·5″ broad; sutures, thickened, densely yellowish-grey tomentose; seeds 2-7, small, yellowish-brown.

Dry forests of the Western peninsula; Ceylon where it is sometimes planted in gardens as an ornamental shrub; on the rocky hills east of Belgaum; common in the forests near Badami in the Bijapur district. Fl. July-Sept. Fr. Oct.-Nov. A large shrub or small tree with pale-yellowish corky bark. Sapwood white or yellowish. Heartwood dark yellowish-brown, hard, heavy and smooth. Pores few, small, joined by wavy bands of white tissue in concentric lines, close together, sometimes anastomosing. Medullary rays many, fine, short. Weighs 60 lbs. to the cub. ft. Timber too small to be of much economic use.

5. TEPHROSIA, PERS.

Herbs or under-shrubs. Leaves sometimes simple, usually oddpinnate; stipules linear or setaceous; leaflets opposite, usually numerous, subcoriaceous, parallel veined and silky beneath. Flowers in leaf-opposed racemes or solitary or in pairs in the leaf-axils. Calyx-tube campanulate; teeth distinct, usually subequal. Petals clawed. Stamens diadelphous; anthers obtuse, uniform. Ovary with numerous ovules; style incurved, often flattened, glabrous or bearded. Pod linear, flattened, 2-valved, many-seeded, continuous or obscurely septate between the seeds; seeds sometimes with a small strophiole.

T. purpurea, Pers. Syn. Pl. V, 2, 329; Fl. Br. I. 2, 112; Gamble Ind. Timb. 234; Cooke Fl. Pres. Bomb. 1, 325. *Unhali, sarpunku,* Vern.

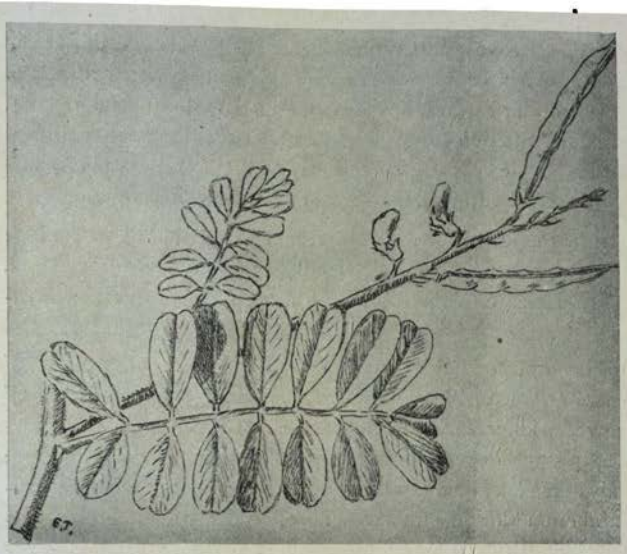


Fig 219. Tephrosia purpurea, Pers.

A much-branched glabrescent or downy under-shrub; stems terete, 1′-2′ high. Leaves 2″-4″ long, short-petioled; leaflets 13-21; oblanceolate, obtuse, mucronate, ·75″-1·2″ by ·2″-·5″, glabrous above, white adpressed-silky beneath; lateral-nerves numerous, parallel, ascending, conspicuous on both surfaces; petiolules short. Flowers in leaf-opposed, lax racemes 3″-5″ long; lower-flowers fascicled. Calyx ·2″ long; teeth triangular-subulate as long as the tube. Corolla twice as long as the calyx. Style flattened; stigma penicellate. Pods 1·5″-2″ long by ·2″ broad, glabrescent, slightly curved, 5-6-seeded.

A small under-shrub, very common and often gregarious in open situations along the borders of forest, cultivated lands or road-sides from the coast inland. There are several other under-shrubs belonging to the genus found in the presidency but *Tephrosia purpurea,* is the most common and widely distributed species.

6. SESBANIA, Pers.

Shrubs, herbs or soft-wooded trees. Leaves long, abruptly-pinnate; leaflets numerous, deciduous, entire, mucronate. Flowers showy, in axillary lax racemes. Calyx campanulate, 2-lipped or 5-toothed. Corolla much exserted; petals with long claws; standard orbicular or ovate; keel obtuse not beaked. Stamens diadelphous; anthers uniform. Style filiform, incurved; stigma capitate. Pod very long, narrow, with distinct septa between the numerous seeds.

Flowers small. Pod weak, twisted ... ... 1. S. ægyptiaca.
Flowers very large. Pod falcate, firm, not twisted 2. S. grandiflora.

1. S. ægyptiaca, Pers.; DC. Prodr. 2, 264; Fl. Br. I. 2, 114; Brandis For. Fl. 137; Bedd. Fl.. Sylv. 86; Cooke Fl. Pres. Bomb. 1, 328; Gamble Ind. Timb. 235. *Shewarie,* M.

A soft-wooded, unarmed shrub, 6′-10′ high with numerous, spreading, nearly glabrous branches; young parts silky. Leaves 3″-6″ long; leaflets 21-41, glabrous, linear-oblong obtuse, apiculate, glabrous or nearly so, pale-green, somewhat glaucous. Flowers 6-10, in lax racemes; pedicels ·25″ long. Calyx glabrous, membranous; teeth short. Corolla about 1″ long, yellow, tinged and spotted with red. Pod 5″-9″ long, weak, torulose, twisted.

Plains from the Himalayas to Ceylon and Siam. Rare along nalas and water-courses in Noth Kanara, but certainly not indigenous; commonly planted in gardens throughout the presidency, sometimes an escape. Fl. R. and C. S. In the Satara District grown in thickets 20′ high to support pepper-vines. In the drier parts of the Deccan grown as a substitute for bamboos. A short-lived herbaceous shrub. Wood white, extremely soft; weighs 27 lbs. to the cub. ft. (Gamble). Rope is made from the bark-fibre The leaves and branches are used for fodder.

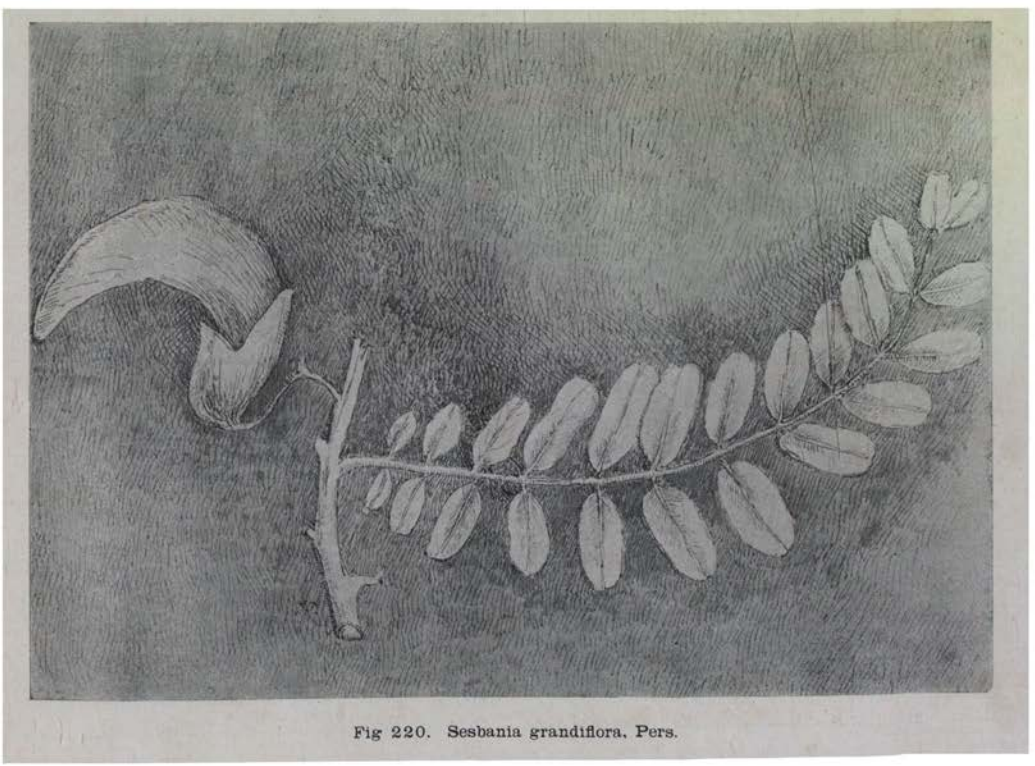


Fig 220. Sesbania grandiflora, Pers.

2. S. grandiflora, Pers. Syn. 2, 316; Fl. Br. I. 2, 115; Bedd, Fl. Sylv. 86; Brandis For. Fl. 137; *Agati grandiflora,* Dalz. & Gibs. Bomb. Fl. Suppl. 22. *Agasta, hadga,* M.

Leaves ·5′ to 1′ long; leaflets 10-30 pairs, linear-oblong, pale-green or glaucous, glabrous, 1″-1·5″ long. Flowers very large and showy, 2″-4″ long, in short, axillary racemes. Calyx 1″ long, shallowly 2-lipped. Corolla sickle-shaped, 3″-4″ long, white, tinged with red. Pod 1′ long, ·3″ broad, tetragonous, falcate, firm; sutures thickened.

Indigenous in the Indian Archipelago and N. Australia; commonly cultivated throughout the presidency, often as a support for the *Betel* pepper-vine. An ornamental soft-wooded and short-lived tree; attains a height of 20′-30′. Bark light-brown, smooth. Fl. and Fr. at various times throughout the year. Wood white, soft; weighs 32 lbs. to the cub. ft. The young tender leaves, flowers and pods are eaten as a vegetable.

7. TAVERNIERA, DC.

Much-branched undershrubs. Leaves simple or pinnately 3-foliate; stipules scarious; leaflets exstipulate. Flowers in axillary lax racemes. Calyx-tube turbinate; teeth setaceous, subequal. Corolla much exserted. Stamens monadelphous; anthers uniform. Ovary stalked; ovules 2-4; style inflexed; stigma capitate, terminal. Pod 1-3 flattened muricated, indehiscent joints; seeds reniform.

Taverniera nummularia, DC. Prodr. 2, 339; Fl. Br. I. 2, 140; *T. cuneifolia,* Arn.; Dalz. & Gibs. Bomb. Fl. 67.

A low, copiously branched under-shrub, with shortly pedicelled, simple or 3-foliate, small leaves. Racemes few-flowered. Flowers small. Calyx thinly silky. Corolla exserted, red, glabrous. Ovary stalked. Pod of 1-4, flattened, muricated, rounded joints.

Plains of Sind and the Punjab, Guzerat and the Deccan in waste places, very common in the Poona and Khandesh districts in stony barren places also along water courses. Fl. throughout the year. This is also a xerophitic species allied to the *Camelthorn.* The roots are sweet like liquorice.

8. ALHAGI, Desv.

Rigid-branched shrubs with slender or stout, axillary, spinescent branchlets, often bearing leaves and flowers. Leaves stipulate, simple, small. Flowers axillary. Calyx campanulate; teeth minute, sub-equal. Corolla exserted; standard broad; keel incurved, obtuse. Stamens diadelphous; anthers uniform.

Ovary stalked; ovules numerous; style filiform, incurved; stigma minute, capitate. Pod linear, moniliform, falcate or straight, joints not separating; seed reniform.

A. Camelorum, Fischer; Prain Jour. As. Soc. Beng, vol. 66, 377; Cooke Fl. Pres. Bomb. 1 333; *A. Maurorum,* Fl. Br. I. 2, 145; Dalz. & Gibs. Bomb. Fl. 67; Brandis For. Fl. 144. *The Camelthorn; Persian Manna Plant. Kas,* Sind. *Jawassi, Javasa,* Vern.

Branches slender, glabrous or nearly so, pale-green; spines ·5″-1″ long, hard, pungent. Leaves at the base of the spines small, entire, ·25″-·5″ by ·1″-·20″, obovate-oblong, rigidly coriaceous, shortly petioled. Flowers small, 1-6 on the spines, shortly pedicellate. Calyx glabrous, .15″ long; teeth short, triangular. Corolla reddish, 3-times as long as the calyx. Ovary glabrous. Pod 1″ long, falcate or straight, turgid, contracted between the seeds, glabrous; seeds dark-brown, smooth, shining.

N. W. Provinces; very common near Delhi; W. Asia, Greece and Egypt; throughout the dry plains of Guzerat and Sind, rare in the Deccan. Fl. Mch.-Apl. Fr. Aug. A low, erect, xerophitic shrub, growing on dry barren and sandy soil. *A. Maurorum,* Tournef. has been separated from *A. Camelorum,* by Prain on account of its silky ovaries.

9. STYLOSANTHES, Sw.

Undershrubs. Leaves rigid, pinnately trifoliate, stipulate. Flowers inconspicuous, in dense heads. Calyx with an elongated, filiform tube. Corolla not exserted; keel subrostrate. Stamens monadelphous; anthers dimorphous. Style long filiform, the lower part persistent; stigma minute, capitate. Pod flattened, 1-2-jointed; joints rugose.

S. mucronata, Willd.; DC. Prodr. 2, 318; Fl. Br. I. 2, 148; Bedd. Ic. 294; Trimen Fl. Ceyl. 2, 36; Cooke Fl. Pres. Bomb. 1, 334.

A low, diffuse undershrub with terete, wiry, ascending, pubescent branches. Leaves pinnately trifoliate; stipules scarious, strongly nerved, adnate to the base of the petiole; leaflets exstipellate, glabrous above, silky-pubescent beneath, elliptic-oblong, acute, mucronate, ·6″-·3″ by ·3″-·15″; lateral-nerves 3-4 pairs, strong beneath, arching. Flowers small, yellow, 1 or several, sessile in the axils of the bracts; bracts striated, pubescent. Calyx ·1″ long, membranous. Corolla exserted, twice as long as the calyx. Pod concealed by the persistent bracts, tipped with the hardened curved style; joints pubescent with raised veins.

Common in open bush-wood on the dry hills near Dharwar; shores of the Western peninsula, (Fl. Br. I); Ceylon in dry desert situations; Tropical and S. Africa. Fl. and Fr. R. S. Not a forest species, and scarcely worth including in this flora.

10. OUGEINIA, BENTH.

A tree. Leaves pinnately trifoliate; stipules free, deciduous; leaflets stipellate. Flowers in fascicled, axillary racemes. Calyx-tube campanulate; teeth small; upper 2 sub-connate. Corolla much exserted; standard broad; keel obtuse. Stamens diadelphous; anthers uniform. Style filiform, incurved; stigma minute, capitate. Pod linear, flat, smooth, 2-5-jointed; joints more or less distinct.

O. dalbergioides, Benth. Pl. Jungh. 216; Fl. Br. I. 2, 161; Bedd. Fl. Sylv. t. 36; Brandis For. Fl. 146; Cooke Fl. Pres. Bomb. 1, 350; Brandis Ind. Trees, 224; *Dalbergia Oojeinensis,* Roxb.; Dalz. & Gibs. Bomb. Fl. 78; Wight Ic. 391. *Kuri-mutal,* K.; *Kala-phulas, tewas,* M.; *Telus,* Khandesh Dangs. *Tunaj, sandan, timsa,* Vern.

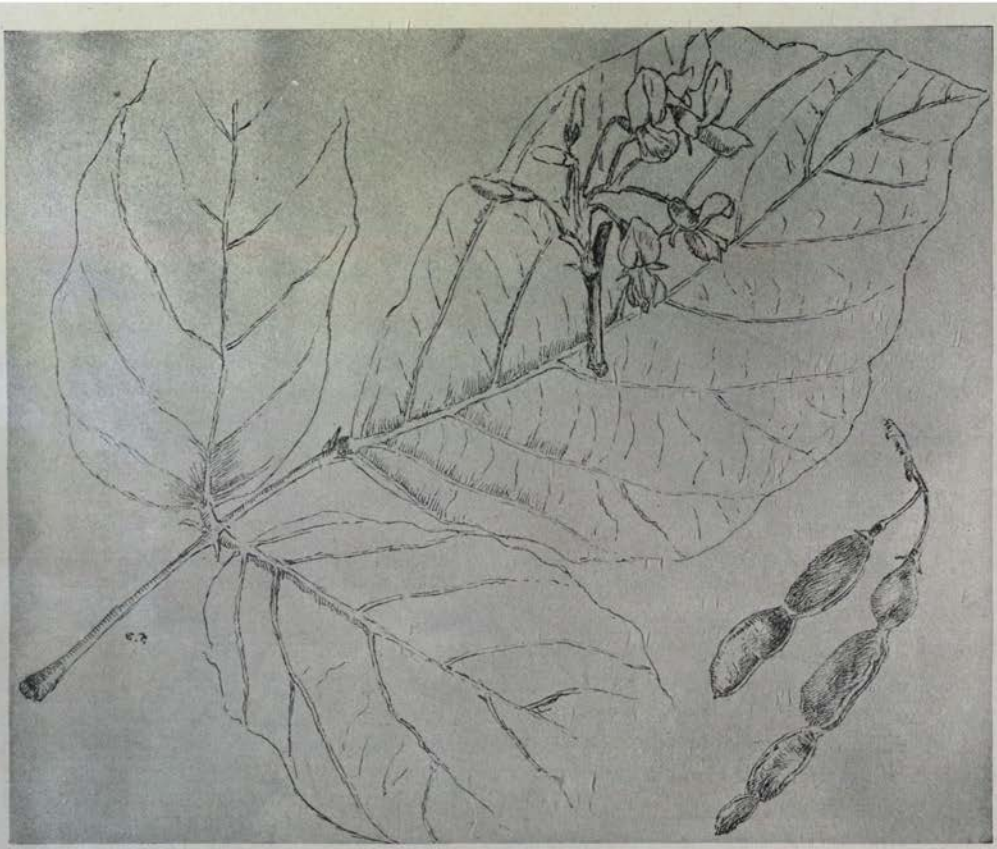


Fig 221. Ougeinia dalbergioides, Benth.

Leaves petioled, rigidly coriaceous and pale when dry; leaflets stipellate; end-leaflet obovate, broad, bluntly-acuminate or obtuse, 3″-6″ by 2″-4″; lateral, opposite, ovate, oblique, cordate, 3″-4″ by 1·5″-3″; petiolules very short; all leaflets nearly glabrous, shallow-crenate; lateral-nerves 4-8 pairs, strong. Flowers numerous, in fascicled racemes from the old wood, 1″-2″ broad; buds and minute bracts densely tomentose; pedicels slender, about ·5″ long; bracteoles beneath calyx, minute, villous. Calyx campanulate, 2-lipped, ·2″ long; teeth rather acute. Corolla twice the calyx, rose-coloured. Pod jointed, 2″-3·5″ by ·5″; joints 1-3, veined, twice as long as broad, very deeply indented along the dorsal suture.

Sub-Himalayan zone from the Sutlej to the Teesta, ascending to 5000′; Central India, Orissa and the Circars, as far south as the Godavery. Throughout the Bombay Presidency in deciduous monsoon-forests, sometimes gregarious. In the Yellapore and Haliál subdivisions of N. Kanara occurs mixed with Teak, Blackwood and Jamba; comparitively large stems yielding logs containing 25 to 40 cubic feet of timber are not uncommon in these jungles. Large trees are also found between Nagziri and Toranmal in the West Khandesh Akrani, growing on the Deccan trap and evidently often produced by means of root-suckers. Small stunted *Tewas* is very common in the open forest on the Toranmal plateau at 3700′ elevation. A small or moderate-sized tree, 30′-80′ high, sometimes 3′ in diameter, often with an irregularly-shaped, gnarled trunk. Bark thin, light-brown with longitudinal and horizontal cracks, scaling off in regular-shaped patches. Wood hard, elastic, tough and close-grained; sapwood small, grey; heart-wood mottled, light-brown. Annual-rings indistinct. Pores large or medium-sized, numerous, enclosed in irregularly-shaped patches and bands of soft white tissue and occupying more than half the area in cross sections of the wood. Medullary rays equidistant, numerous, fine, white and distinct. Weighs 52 to 60 lbs. to the cub. ft. A very useful and valuable timber not attacked by white ants and taking a fine polish; used for carriage-shafts, wheels of carts, furniture and is in great demand in the Deccan districts for agricultural implements. In the "Flora Indica" Roxburgh states that the pillars of Mahadji Shindia's palace at Oojein are made of it. The bark is used to intoxicate fish. Incisions in the bark yield a transparent astringent gum-resin similar to *Dragon's Blood*. A cristalline substance probably magnesia is sometimes found in the wood of diseased trees. The young branches are much lopped for cattle fodder in the Deccan. Tewas is a handsome tree when in bloom in the dry Khandesh Akrani jungles during the hot season, and when quite bare of leaves. In the comparatively moist forests of N. Kanara it is never quite without foliage nor does it produce flowers abundantly. It is sometimes cultivated as an ornamental tree in gardens. Fl. March-May. Fruit June.

11. DESMODIUM, DESV.

Shrubs or herbs. Leaves simple or pinnately trifoliate; stipules usually striate, dry, free or united; leaflets stipellate. Flowers small, red, in copious dense racemes. Calyx campanulate or turbinate; teeth longer or shorter than the tube. Corolla exserted; standard broad; keel obtuse. Stamens diadelphous or the 10th stamen free at the base and adhering to the sheath higher up. Style incurved; stigma capitate. Pod of several 1-seeded, compressed, usually indehiscent joints. A large genus of undershrubs, shrubs or herbs with jointed pods.

Leaves trifoliate. Umbels axillary; bracts minute, deciduous.
- Branches terete. Joints of pod large.... ... 1. D. umbellatum.
- Branches triquetrous. Joints of pod small ... 2. D. Cephalotes.

Leaves trifoliate. Umbels in continuous rows; bracts large, leafy, persistent ... ... 3. D. pulchellum.

Leaves unifoliate; petioles winged ... ... 4. D. triquetrum.

Leaves 1-3-foliate. Flowers in simple or panicled-racemes.
Joints of pod indehiscent.
- Leaves trifoliate ... ... 5. D. laxiflorum.
- Leaves unifoliate.
  - Leaflet glabrescent above ... ... 6. D. gangeticum.
  - Leaflet scabrous above ... ... 7. D. latifolium.

Joints of pod dehiscent ... ... 8. D. polycarpum.

Pod dehiscent, not jointed... ... ... 9. D. gyrans.

1. D. umbellatum, DC. Prodr. 2, 325; Fl. Br. I. 2, 161; Bedd. Fl. Sylv. 87; Dalz. & Gibs. Bomb. Fl. 66; Cooke. Fl. Pres. Bomb. 1, 352; Brandis Ind. Trees, 223; Gamble Ind. Timb. 238.

A large shrub sometimes a small tree; branches terete, downy; leaflets thinly coriaceous, glabrous above, thinly grey-pubescent beneath, broad-ovate, obtuse; terminal leaflet 3″-2″ by 2″-1·5″; lateral smaller; petioles about 1″ long, slightly furrowed; stipels ·12″ long, subulate. Umbels axillary, peduncled, 6-12-flowered; peduncles ·5″-·3″ long. Calyx silky; tube short; teeth triangular. Corolla white, ·5″ long. Pod 1·5″-2″ long; joints 4-5, thick, glabrescent, flattened, very distinctly indented at the sutures.

Sea coast of the Eastern peninsula, Penang, Malacca, Ceylon. South-east of Surat; near Belgaum, Law. (Dalz. & Gibs.) This species is I think doubtfully indigenous in the Bombay Presidency.

2. D. Cephalotes, Wall. Cat. 5721; var. *congestum,* Prain in Jour. As. Soc. Beng. v. 66, 389; Fl. Br. I. 2, 161; Bedd. Fl. Sylv. 87; Trimen Fl. Ceyl. 2, 47; Cooke Fl. Pres. Bomb. 1, 352; Gamble Ind. Timb. 238; Brandis Ind. Trees, 222; *D. congestum,* Wall. Cat. 5721; Dalz. & Gibs. Bomb. Fl. 66.

A shrub usually about 5′-6′ high; branches triquetrous, zigzag, ascending, densely adpressed grey-silky; leaflets obovate, acute; terminal-leaflet 2·75″-4″ by 1·2″-2″; lateral smaller, green, glabrous above, grey silky beneath, with numerous, distinct parallel nerves arching upwards; stipels ·3″ long, filiform. Flowers 20 or more in dense, short, axillary umbels; pedicels unequal, 0-·1″ long, silvery-hairy, jointed at the top. Calyx ·2″ long, campanulate; teeth lanceolate. Corolla twice the calyx, deep-red. Pod under 1″ long, pubescent, silky or glabrous, slightly curved, indented on the lower suture; joints 3-6, as broad as long.

E. Himalayas, S. India, Burma; common in the moist mixed monsoon-forests of North Kanara and the Konkan. Fl. July-Sept. Fr. C. S. Wood yellowish, Gamble.

3. D. pulchellum, Benth. MSS.; Fl. Br. I. 2, 162; Gamble Ind. Timb. 239; Cooke Fl. Pres. Bomb. 1, 353; Trimen Fl. Ceyl. 2, 48. *Chikti,* K.; *Lukthya,* Bhil.

A shrub 3′-6′ high with slender, terete, finely grey-pubescent branches. Leaflets ovate-elliptic, obtuse or sub-acute, coriaceous, glabrous; end-leaflet much the largest, 2″-5″ by 1″-2·5″; nerves strong, parallel on the downy under surface. Racemes 6″-12″ long, consisting of many bracteate umbels; bracts orbicular, oblique with 4-5 pairs of parallel nerves, about ·5″ across. Flowers small, concealed by the bracts, in 2-6-flowered umbels. Calyx ·15″ long. Corolla yellow, 3-times as long as the calyx. Pod ·20″ long, indented on both sutures; joints 1-3, glabrescent, constricted at both sutures. At once recognised by the persistent, orbicular, plicate bracts.

Tropical India from the E. Himalayas southwards to Burma and Ceylon; throughout the presidency in moist places along nalas and water-courses; common in North Kanara, often gregarious as under growth in the high timber deciduous monsoon-forests on the Yellapur ghàts. Fl. and Fr. R. S. Seeds eaten by the Bhils in the Surat Dangs.

4. D. triquetrum, DC. Prodr. 2, 326; Fl. Br. I. 2, 163; Dalz. & Gibs. Bomb. Fl. 66; Cooke Fl. Pres. Bomb. 1, 355; Brandis Ind. Trees, 224. *Antbarlu,* K.

A simple-stemmed under-shrub with a few triqetrous, glabrescent branches. Leaves 1-foliate with broadly-winged petioles; leaflet oblong, lanceolate, 4″-6″ by 1″-2″, rigidly subcoriaceous, glabrous above, hairy on the nerves beneath; petioles ·75″-1·25″ long; wing variable in breadth of the same texture as the leaf, broadest near the blade of the leaflet; stipules twin, thin, ·75″ long, lanceolate

from a broad base. Racemes 6″-12″ long, axillary and terminal. Flowers ·5″ long. Calyx campanulate, slightly hairy. Corolla violet, ·3″ long; bracts minute. Pod sessile, 1″-2″ long, glabrous or hairy, thin; joints nearly quadrangular, more or less strigose with adpressed hairs; sutures scarcely indented.

Throughout India proper to Ceylon, China, Philippines, Central and Eastern Himalayas; common in the moist forests of the Konkan and North Kanara from the coast inland. Fl. Sept.-Jan. Fr. C. S. A very distinct species of which the reddish-winged petioles and the triquetrous branches are characteristic.

5. D. laxiflorum, DC. Prodr. 2, 335; Fl. Br. I. 2, 164; Cooke Fl. Pres. Bomb. 1, 353; Brandis Ind. Trees, 223. *Jungly-ganga,* Vern.

An erect undershrub, 2′-3′ high with slender, obtusely-angled branches. Leaves trifoliate; leaflets membranous, glabrous above, minutely adpressed-hairy beneath; terminal larger than the lateral, ovate, acute; blade 3″-6″ by 1·5″-2·75″; lateral-nerves 7-12 pairs, slender, strong beneath; petioles 1″-2″ long. Racemes 6″-12″ long, slender, often compound. Flowers several, fascicled along a slender, hairy rachis; pedicels filiform, pubescent, at length spreading, ·25″ long; bracts and bracteoles minute, linear-subulate. Calyx ·1″ long, campanulate, strigose. Corolla ·25″ long; standard white; wings and keel blue. Pod 1″-1·5″ long, curved, linear, narrow; joints 6-10, covered with minute hooked hairs, not or scarcely constricted between the seeds, easily distinguished by the large, pale-green leaflets, the long branched inflorescence and the slender pods.

Throughout India; Java, Borneo, Philippines; gregarious and common in the undergrowth of the mixed monsoon-forests along the Yellapore and Supa ghâts of North Kanara. Fl. and Fr. R. & C. S. The joints of the pod strongly adhere to clothes etc. which come in contact with them.

6. D. gangeticum, DC. Prodr. 2, 327; Fl. Br. I. 2, 168; Dalz. & Gibs. Bomb. Fl. 66; Cooke Fl. Pres. Bomb. 1, 356; Brandis Ind. Trees, 224. *Salparni, Salwan daye,* Bomb.

A woody undershrub, 3′-4′ high. Leaves 1-foliate; leaflet thin or sub-coriaceous, broadly ovate, acute, narrowed upwards, glabrescent on the upper surface, thinly clothed beneath with adpressed grey hairs; blade 3·5″-5″ by 1·20″-2·5″; petioles ·25″-1·20″ long, acutely angled; stipules ·75″ long, filiform or setaceous from a broad base. Racemes axillary, ascending, 1′ or more long. Flowers small; bracts minute, setaceous. Calyx ·1″ long, hairy; teeth triangular. Corolla ·2″ long, violet or white. Pod 6-8-jointed, sub-falcate, ·5″-·75″ by ·1″, glabrescent or clothed with a few hooked hairs; upper suture much indented. The variety *maculatum,* differs from the type in the small, blotched, rounded cordate leaves, about 1″ long. This variety is common in some of the N. Kanara deciduous forests.

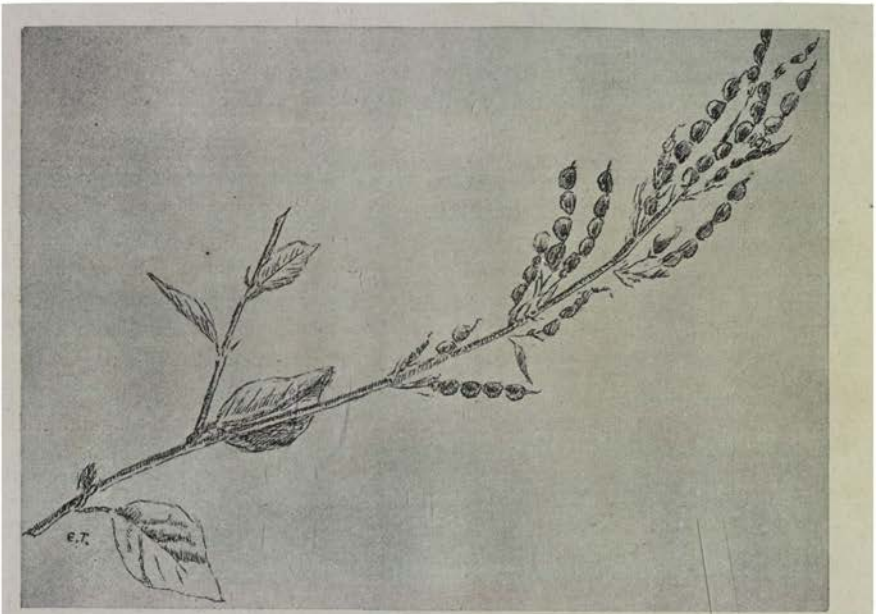


Fig 222. Desmodium gangeticum, DC.

Lower hills and plains of India; ascends to 5000′ on the Himalayas and eastwards to Pegu, Ceylon, Borneo, Sumatra, and the Philippines; throughout the presidency both in the plains and in the deciduous monsoon-forests of the Konkan and North Kanara, Fl. May.-June. Fr. July-Aug.; in the Khandesh Akrani it is abundant in open places up to 3700′, springing up from burnt stems early in April when the flowers appear, followed with great rapidity in two or three days by the fruits.

7. D. latifolium, DC. Prodr. 2, 327; Fl. Br. I, 2, 168; Dalz. & Gibs. Bomb. Fl. 66; Cooke Fl. Pres. Bomb. 1, 356; Brandis Ind. Trees, 224.

An erect undershrub, 3′-6′ high, sparingly branched; branches terete, tough, densely brown-tomentose. Leaves 1-foliate; leaflet thick, ovate, coriaceous, broadly-cordate or truncate at the base; blade 4″-1·5″ by 3·5″-1·25″, densely clothed with soft, brown hairs beneath, persistently scabrous on the upper surface; petioles thick, about ·5″ long with a pair of small stipels at the top; stipules setaceous, short. Racemes sessile or peduncled, ascending, dense, axillary and terminal; the latter compound. Flowers small; bracts minute, setaceous. Calyx minute, hairy. Corolla ·2″ long, purple. Pod ·5″-·75″ by ·1″, 4-6-jointed,

clothed with minute, hooked hairs; upper and lower sutures indented. Easily distinguished by the pale, thick, truncate, broad, blunt leaves and the copious spike-like racemes. Eastern Himalayas to Burma, Siam and Ceylon. In the moist forests of the Konkan and North Kanara. Fl. and Fr. R. S. Yields a strong fibre useful for paper making.

8. D. polycarpum, DC. Prodr. 2, 334; Fl. Br. I. 2, 171; Dalz. & Gibs. Bomb. Fl. 66; Cooke Fl. Pres. Bomb. 1, 354; Brandis Ind. Trees, 223.

A small undershrub with woody, slender branches. Leaflets 3, subcoriaceous, glabrous above, glabrescent beneath; terminal-leaflet obovate, obtuse; blade 1″-2·5″ by ·75″-1″; lateral smaller. Flowers in dense, terminal and axillary racemes, 1″-3″ long; bracts small. Calyx ·1″ long, glabrescent. Corolla ·2″ long, purple. Pods ·5″-·75″ by ·15″, 5-8-jointed; joints dehiscent, brown-hairy on the sutures; upper suture indented.

Himalaya to Ceylon, China, Japan and Polynesia; abundant throughout the presidency. A common species in N. Kanara both in forest and in open fields. Fl. R. S. Fr. C. S.

9. D. gyrans, DC. Prodr. 2, 326; Fl. Br. I. 2, 174; Trimen Fl. Ceyl. 2, 56; Cooke Fl. Pres. Bomb. 1, 358. *The Semaphore Plant.*

A small undershrub, 2′-4′ high. Leaves 1-3-foliate, terminal-leaflet large, 1″-2·5″ by ·25″-·5″, ovate, obtuse or emarginate, subcoriaceous, glabrescent above, more or less silky-pubescent beneath; lateral-leaflets when present small, moving during the day time up and down with alternate jerks. Racemes axillary and terminal, the latter panicled; the flowers are at first hidden by large ovate, striate, deciduous bracts. Calyx ·1″ long, membranous, campanulate. Corolla ·3″ long, red or pink. Pod falcate, 1″-1·5″ by ·2″, 6-10-jointed, dehiscent and slightly indented along the lower suture. The var. *Roylei,* with larger terminal leaflets and corollas is common in N. Kanara in the dense moist rain and monsoon-forests along the Western ghâts.

Along the Himalayas from Hazara to Assam ascending to 7000′. Western Peninsula, Ceylon, Ava, Pegu; throughout the moist monsoon-forests of the Konkan and North Kanara, very common. Fl. R. S. Fr. Oct.-Nov. The peculiar jerky motion of the lateral leaflets has been much commented on by botanists.

The species of *Desmodium,* mostly undershrubs, are common and often constitute an appreciable proportion of the undergrowth in many forests of the Konkan and North Kanara.

12. ABRUS, LINN.

Twining perennials. Leaves abruptly-pinnate; leaflets numerous, deciduous; petiole ending in a bristle. Flowers small, in dense racemes on axillary peduncles

or short branches. Calyx campanulate, truncate; teeth short. Corolla exserted; keel arcuate. Stamens 9, united in a tube, the 10th absent; anthers uniform, Ovary sub-sessile; ovules many; style short, incurved, glabrous; stigma capitate. Pod thin or turgid, septate between the seeds.

Pod turgid, 4-6-seeded	... 1. A. precatorius.
Pod thin, flat, 8-12-seeded	... 2. A. pulchellus.

1. A. precatorius, Linn.; DC. Prodr. 2, 381; Fl. Br. I. 2, 175; Dalz. & Gibs. Bomb. Fl. 76; Brandis For. Fl. 139; Cooke Fl. Pres. Bomb. 1, 359; Brandis Ind. Trees, 225. *Indian or Wild Liquorice Root. Gunchi,* Vern.; *Kati, gulgunji,* K,; *Gunja,* Sans.

Fig 223. Abrus precatorius, wall.

A branched, nearly glabrous twiner; branches slender. Leaves paripinnate, 4″ long; leaflets 8-20 pairs, ligulate-oblong; blade ·3″-·75″ by ·15″-·2″, membranous, deciduous. Flowers rather small, in crowded racemes, shorter than the leaves; rachis thickened in fruit. Calyx thinly silky, ·2″ long. Corolla rose-coloured, 3-times as long as the calyx. Pod 1″-1·5″ by ·4″, turgid, finely silky, 4-6-seeded; seeds bright-scarlet with a black spot, black or white or black with a white spot, size about as large as a pea.

Himalayas, ascending to 3000′, Tropical India, Ceylon, often planted; throughout the presidency, in the moist forests of the Konkan and North Kanara, common near the sea-coast in open littoral forests. Fl. R. S. Fr. Jan.

The seeds which weigh about 1¾ grains each are used as weights by goldsmiths, and for making rosaries and ornaments; they are also

employed to poison cattle. The method is to introduce some of the paste made from the powdered seeds beneath the animal's skin. The root is said to be a substitute for liquorice. An extract is also made from the leaves which is used in native medicine.

2. A. pulchellus, Wall. Cat. 5819; Fl. Br. I. 2, 175; Cooke Fl. Pres. Bomb. 1, 359; Brandis Ind. Trees, 225.

Same habit as *A. precatorius,* but the stems are slightly hairy. Leaves paripinnate, 4″ long; stipules linear-lanceolate, ·25″ long; petioles ·5″-·75″ long, thickened at the base; leaflets narrowly-oblong, rounded, apiculate, membranous, 12-16 pairs; blade ·5″-1·5″ by ·2″-·5″, green above, paler beneath, thinly-silky; petiolules very short; stipels 0. Flowers numerous in long-peduncled, lax racemes, equalling or exceeding the leaves. Calyx ·12″ long, thinly silky. Corolla pink or pale blue, ·25″ long. Pod slightly curved, shortly beaked and thinly hairy 2″-2·5″ by ·5″; valves thin, smooth and flat; seeds 8-12, oblong, compressed, black, smooth and shining.

Eastern Bengal, Burmah, Sikkim, Ceylon, Malaya, Tropical and South Africa and S. E. Asia; in the moist forests of North Kanara; very common near Karwar and along the coast in littoral forests southwards; apparentely not found in the Northern districts of the presidency. Fl. R. S. Fr. Nov.-Jan.

13 MUCUNA, ADANS.

Woody or herbaceous, twining plants. Leaves pinnately trifoliate, stipellate. Flowers large, showy, in racemes, often pendulous, purple or yellowish-green, turning black when dry. Calyx-tube campanulate, 2 upper-teeth connate. Corolla exserted; keel rostrate, exceeding the wings. Stamens diadelphous; anthers dimorphous. Ovary sessile; ovules numerous; style incurved; stigma capitate. Pod of variable shape, clothed with brittle, fine, irritating bristles.

Pod obliquely and transversely plaited, 1-seeded ... 1. M. monosperma.
Pod without plaits, several-seeded... ... ... 2. M. pruriens.

1. M. monosperma, DC. Prodr. 2, 406; Fl. Br. I. 2, 185; Dalz. & Gibs. Bomb. Fl. 70; Cooke Fl. Pres. Bomb. 1, 364; Trimen Fl. Ceylon 2, 61; Brandis Ind. Trees, 225. *The Negro Bean, Sonagaravi; mothi-kuhili,* Vern.

A lofty, spreading climber with numerous slender branches clothed with rusty, deciduous tomentum, soon glabrous. Leaves 6″-9″ long, membranous, thinly covered with long ferruginous hairs, mostly on the nervation beneath; petioles 3″-4″ long; end-leaflet ovate-oblong or elliptic, shortly cuspidate, 2·75″-4″ by 2″-3″; lateral smaller, unequal-sided; lateral-nerves 5-7 pairs. Flowers in

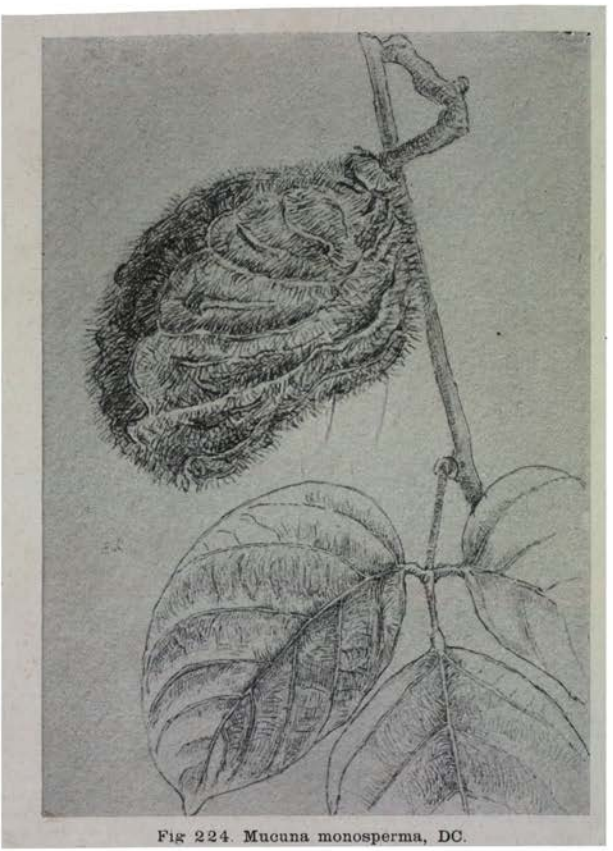


Fig 224. Mucuna monosperma, DC.

corymbose, short-peduncled, 6-12-flowered racemes; bracteoles linear, longer than the buds. Calyx ·4″ long, broad-campanulate, subtruncate, covered with red, irritant bristles. Corolla 1·5″ long; keel abruptly incurved at the top, dark-purple: pedicels ·5″ long. Pod 1·5″-2″ across, thick, orbicular, obliquely-plaited and densely covered with red, deciduous, irritant bristles, scarcely winged along the sutures; seed nearly orbicular, compressed, dark-brown; hilum linear, extending round ¾th of the edge.

E. Himalayas, Khasia Hills, Assam, Pegu, Ceylon and the Malay Archipelago; in the moist rain and monsoon-forests along the Konkan and North Kanara ghâts, locally common. Fl. C. S. Fr. H. & R. S. The seed is used as a vegetable, also in native medicine.

2. M. pruriens, DC. Prodr. 2, 405; Fl. Br. I. 2, 187; Cooke Fl. Pres. Bomb. 1, 365; Trimen Fl. Ceylon 2, 62; Brandis Ind. Trees, 226; *M. prurita,* Dalz. & Gibs. Bomb. Fl. 70. *The Cowitch. Hasaguni-gidda, turach-gidda,* K.; *Kivanch,* Guz.; *Kuhila,* Vern.

A twining annual. Leaves trifoliate, grey-silky beneath; petioles 2·5″-4·5″ long, silky; stipules lanceolate, ·2″ long; leaflets 4″-5″ by 2″-2·5″, membranous, ovate, rhomboid, acute mucronate, lustrous with grey-pubescence beneath; lateral very unequal-sided. Racemes 6-30-flowered, drooping, about 1′ long. Calyx ·4″ long; tube campanulate, shortly grey-pubescent. Corolla dark-purple,

1·5″ long; keel incurved. Pod turgid, S-shaped, 3″ by ·5″, covered with grey, tawny stinging or irritating hairs; seeds 5-6, small; hilum not half the length of the circumference. The above 2 species are the only members of the genus I have met with in the Bombay forests.

Tropical America, Africa and India; throughout the presidency from the coast inland, common in hedges, sometimes cultivated. Fl. Oct.-Nov. Fr. Dec.-Feb. The seeds and hairs of the pod are used in native medicine, the former as an aphrodisiac and the latter as a vermifuge.

M. atropurpurea, DC. Prodr. 2, 406; Fl. Br. I. 2, 186; with broad 2-seeded, plaited, bristly pods, and *M. gigantea,* DC. Prodr. 2, 405; Fl. Br. I. 2, 186; with broad, winged, not plaited, 2-6-seeded pods are stated by Nimmo to be found in the Konkan, Grah. Cat. Bo. Pl. 53, but have not been observed by subsequent collectors.

14. ERYTHRINA, Linn.

Prickly trees. Leaves trifoliate; stipels small, gladuliform. Flowers large, handsome, coral-red, twin or fascicled along the rachis, in dense, axillary and terminal racemes, usually appearing before the development of the leaves; bracts and bracteoles small or absent. Calyx oblique, spathaceous, splitting to the base or campanulately bilabiate. Petals unequal; standard much exserted and exceeding the keel. Stamens diadelphous; anthers uniform. Ovary stalked; ovules many; style incurved; stigma capitate. Pod stalked, falcate, turgid, and torulose.

Calyx spathaceous, not 2-lipped. Pod thick.
  Calyx 5-cleft at the tip. Pod 6-8-seeded ... 1. E. indica.
  Calyx entire at tip. Pod 2-3-seeded ... ... 2. E. stricta.
Calyx campanulate, 2-lipped. Pod terete, 4-5-seeded 3. E. suberosa.

1. E. indica, Lam.; DC. Prodr. 2, 412; Fl. Br. I. 2, 188; Bedd. Fl. Sylv. 87; Dalz. & Gibs. Bomb. Fl. 70; Brandis For. Fl. 139; Cooke Fl. Pres. Bomb. 1, 366; Brandis Ind. Trees 226; Gamble Ind. Timb. 242; Trimen Fl. Ceylon, 2, 63. *Indian Coral Tree; Mochi-wood; Pangara,* M.; *Mullu-mutala,* K. *Panarvo, panarweo,* Guz.

Branchlets thick; prickles straight, black. Leaves petioled; petioles about 5″ long; end leaflet glabrous, membranous, broader than long, truncate at the base, ovate-rhomboidal, 4″-6″ by 3·5″-5″; lateral smaller; stipules lanceolate, ·4″ long, caducous. Flowers in dense racemes, 4″-9″ long, arranged in few-flowered clusters along the tomentose rachis. Calyx spathaceous, 1″-1·25″ long; mouth very oblique, minutely 5-toothed at the tip. Standard bright-scarlet, 2″-2·5″ by

1″-1·5″; wings and keel ½ as long as the calyx. Stamens much exserted. Pod thick, 6″-12″ long, distinctly torulose, black, 6-8-seeded; seeds large, dark-red.

Fig 225. Erythrina indica, Lamb.

Throughout India from the Himalayas, also in Burma; in the deciduous forests of the Konkán and North Kanara, probably an escape from plantations; indigenous along the sea-coast from Bombay to Kanara above high-water and sometimes associated with *Calophyllum inophyllum*, *Salvadora persica*, *Clerodendron inerme*, *Grewia Microcos*, *Canavalia ensiformis*, *Derris uliginosa*, *etc.*; commonly planted throughout the presidency as a support for pepper-vines. Fl. Apl.-May. Fr. June. A medium-sized, deciduous tree. Bark greenish-yellow, smooth and shining, exfoliating in papery flakes; young branches and stems

prickly; prickles black. Wood soft, white, light, rather durable; weighs about 20 lbs. to the cub. ft.; used for boxes, toys, scabbards, etc.

2. E. stricta, Roxb. Fl. Ind. 3, 251; Fl. Br. I. 2, 189; Dalz. & Gibs. Bomb. Fl. 70; Bedd. Fl. Sylv. t. 175; Cooke Fl. Pres. Bomb. 1, 367; Brandis Ind. Trees 227; Gamble Ind. Timb. 242.

Fig 226. Erythrina stricta, Roxb.

Branches armed with numerous whitish prickles. Leaves with prickly petioles sometimes 6″ long; stipules falcate; leaflets like those of *E. indica;* stipels round, gland-like, persistent. Flowers in dense, unilateral-racemes, 4″-5″ long; several at the ends of stout branches. Calyx ·5″ long, entire at the tip but splitting down the back like that of *E. indica.* Standard bright-scarlet, oblong-lanceolate, 1·5″ long; keel ½ as long as the standard, much exceeding the truncate wings. Pod 4″-5″ long, light-brown, slightly torulose, narrowed at both ends, glabrous, 2-3-seeded; seeds 1-3, light-brown.

Burmah and the W. peninsula. In the deciduous, mixed-forests of North Kanara and the Konkan, locally common. Fl. May. Fr. June. A large or moderate-sized tree. Stems with a rougher bark than in *E. indica,* and more numerous, white prickles. Wood grey, soft, light and spongy. Annual-rings distinct. Pores large, scanty. Medullary rays short and broad. The tissue between the rays consists of narrow bars of harder dark tissue with broad bars of white spongy tissue, forming wavy, concentric, alternate bands; wood used for the same economic purposes as that of *E. indica.*

3. E. suberosa, Roxb. Fl. Ind. 3, 253; Fl. Br. I. 2, 189; Bedd. Fl. Sylv. 87; Dalz. & Gibs. Bomb. Fl. 70; Cooke Fl. Pres. Bomb. 1, 367; Brandis Ind. Trees, 223; Gamble Ind. Timb. 251. *Pangra, pangara,* Vern.; *Sambar,* Bhil.

Branchlets covered sparingly with stout, sharp, conical light-coloured prickles which fall off after the third year. Leaves sometimes with a few prickles

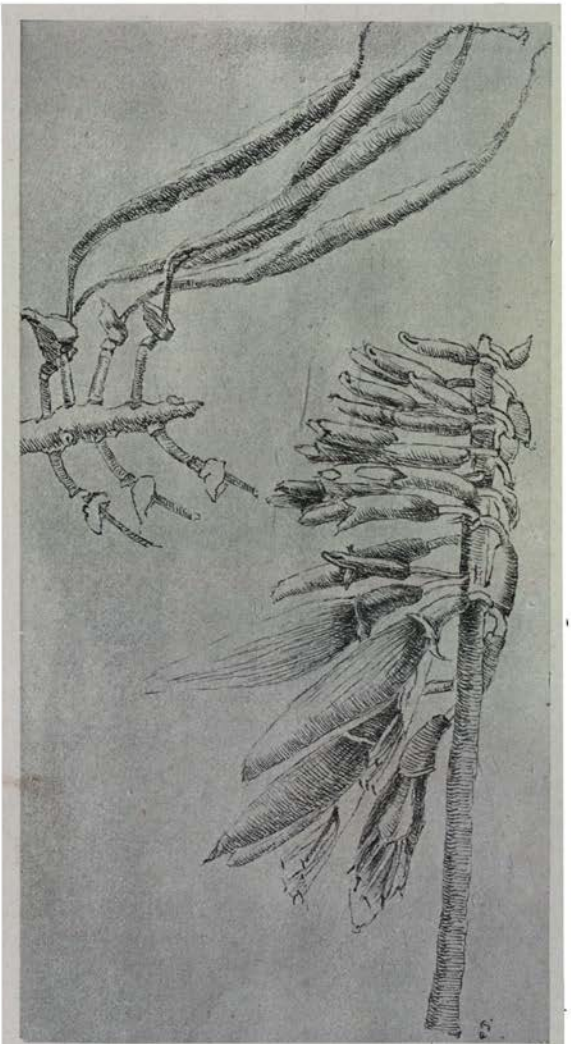


Fig 227. Erythrina suberosa, Roxb.

on the petioles, densely pubescent beneath; leaflets 3″-6″ broad and long, rhomboid, entire or sinuate-deltoid at the base. Racemes capitate. Calyx ·4″ long, downy, soon bilabiate, not splitting to the base. Standard 1·5″-2″ long, bright-red; keel-petals connate, less than ½ the standard; wing-petals minute. Pod curved, terete, long-acuminate, about 6″ by ·5″, scarcely torulose, narrowed at the ends, filled when young with spongy tissue between the seeds which ultimately drops out leaving them attached to the margins of the grey shining, open, flat valves; seeds 4-5, black, reniform.

From the Himalayas to S. India and Burmah ascending to 3000′. Throughout the dry forests of the presidency; common in some of the Khandesh forests, ascends to 3700′ in the Akrani, is not found in the heavy rainfall zone. Fl. Mch.-May. Fr. May-June. A small or moderate-sized, deciduous tree. Bark light-grey, corky, and fissured, particularly so at the base of the stem. Wood white, soft, spongy but fairly durable; weighs about 20 lbs. to the cub. ft.; used for the planking, scabbards, etc.; suitable for boxes to be covered with lacquer.

15. CANAVALIA, DC.

Large perennial twiners. Leaves 3-foliate, stipellate. Flowers large, showy, in racemes. Calyx 2-lipped; the upper projecting, entire; the lower shortly 3-toothed. Corolla exserted; standard large; keel short, incurved. Stamens monadelphous; anthers uniform. Style incurved; stigma terminal. Pod large, prominently ribbed along each side of upper suture; seeds several with a short linear hilum.

Leaflets oval, thin. Racemes many-flowered.
Pod many-seeded ... ... 1. C. ensiformis.
Leaflets broadly obovate, thick. Racemes few-flowered. Pod few-seeded ... ... 2. C. obtusifolia.

1. C. ensiformis, DC. Prodr. 2, 404; Fl. Br. I. 2, 195; Cooke Fl. Pres. Bomb. 1, 373; Trimen Fl. Ceyl. 2, 67; *C. virosa,* Dalz. & Gibs. Bomb. Fl. 69. *Sabre* or *Patagonian Bean; Gowara, arsambal,* Vern.

Fig 228. Canavalia ensiformis, DC.

A perennial or biennial, extensive twining herb. Leaflets ovate-acute or shortly-acuminate, membranous, glabrous, 3″-6″ by 2″-3″; petioles 3″ long;

stipules minute, deciduous. Flowers geminate from tumid nodes, in lax 10-20-flowered racemes at the ends of long peduncles ; pedicels very short; bracteoles minute, ovate, caducous. Calyx about ·4″ long, glabrous, or densely pubescent in Var. *virosa,* the upper lip is ⅓ the length of the tube. Corolla twice the calyx, white or pink. Pod 6″-9″ by 1″-1·25″, turgid, 8-12-seeded; seeds reddish-brown or white, 1″ long.

VAR. *virosa.* Leaflets obovate, broader and more acuminate. Calyx densely pubescent. Pod shorter and broader, 4-6-seeded; seeds bitter.

VAR. *turgida.* Probably the *C. Stocksii,* of Dalz. & Gibs. Bomb. Fl. 69, has a larger and more turgid, pod 3″-5″ by 1·5″-2″, the leaves are like those of *Var. virosa.*

Commonly cultivated. In hedges thoughout the presidency also in the Babul thickets along the banks at Deccan rivers. Fl. and Fr. at different times.

2. C. obtusifolia, DC. Prodr. 2, 404; Fl. Br. I. 2, 196; *C. lineata,* DC. Prodr. 2, 404; Cooke Fl. Pres. Bomb. 1, 373.

Perennial; stems spreading, prostrate, rarely twining, glabrous. Leaves trifoliate; leaflets sub-coriaceous, obovate, obtuse, sometimes emarginate. Racemes 4-8-flowered, usually exceeding the leaves; peduncles 10″-15″ long. Flowers like those of the last, the upper-lip of the calyx shorter. Pod 4″-5″ by 1″, glabrous, 4-6-seeded; seeds ovoid, compressed, dark-brown or black, ·5″ long.

A pink or sometimes white-flowered, littoral species found throughout the Tropics; common along the coasts of North Kanara and the Konkan. Fl. March. Fr. June-July.

C. Stocksii, Dalz. & Gibs. Bomb. Fl. 69; Cooke Fl. Pres. Bomb. 1, 372; *C. ensiformis,* Var. *turgida,* Baker, Fl. Br. I. 2, 196. A twining herb with large, obtuse stipules and bracteoles is considered to be a species distinct from *C. ensiformis,* DC., by Dr. T. Cooke in his Fl. Pres. Bomb. Deccan and Konkan hills, rare.

16. PUERARIA, DC.

Herbs or twining shrubs. Leaves pinnately trifoliate, stipellate. Flowers large and small, densely fascicled, in long racemes; bracts and bracteoles small. Calyx-teeth long or short, the upper two connate. Corolla exserted; standard spurred at base, equalling in length the keel and wings. Stamens monadelphous; anthers uniform. Ovary subsessile; ovules numerous; style filiform incurved; stigma small, capitate. Pod linear, flattish. Root sometimes immense and tuberous in *P. tuberosa.*

P. tuberosa, DC. Prodr. 2, 240; Fl. Br. I. 2, 197; Dalz. & Gibs. Bomb. Fl. 67; Brandis For. Fl. 141; Cooke Fl. Pres. Bomb. 1, 374; Brandis Ind. Trees,

228. *Dari,* Vern.; *Karwi-nai,* Guz.; *Pithana,* M.; *Udkhya, bhoikohola,* Bhil, (Satpuras). The latter name on account of the great tuberous roots.

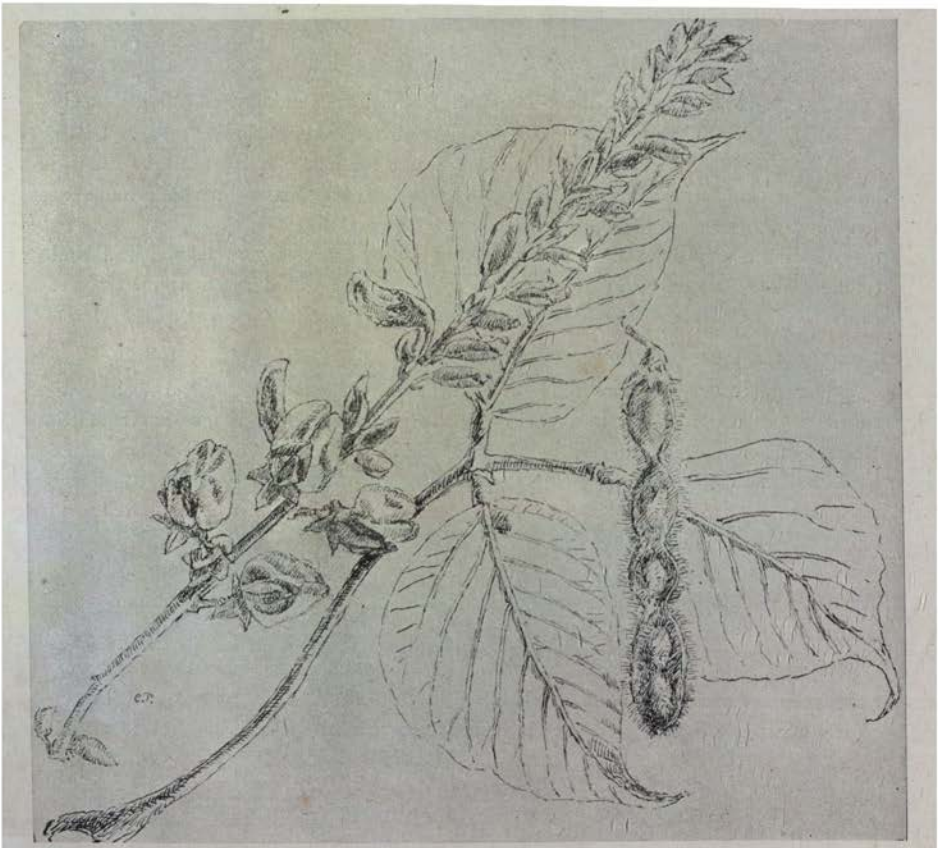


Fig 229. Pueraria tuberosa, DC.

A thick-stemmed, pubescent climber with a large tuberous root; branches finely grey downy. Leaves trifoliate; petioles 4″-6″ long; stipules minute, ovate, cordate; leaflets sub-coriaceous, 5″-8″ by 4·5″-7″, terminal broad, ovate-acuminate, equal-sided and cuneate at the base; lateral unequal-sided, truncate at base, glabrescent above, silky-villous beneath. Flowers in long, woody, simple or branched, lax racemes, 2′-3′ long; pedicels short, densely fascicled. Calyx ·25″ long, densely-rusty pubescent. Corolla purple, nearly twice the calyx; standard orbicular, spurred; the wings are darker coloured than the standard. Pod flat,

2″-3″ long, 3-6-seeded, constricted between the seeds, clothed with silky-grey, bristly, fragile, non-irritant hairs.

Western tropical Himalaya, hills of south India and Orissa; often cultivated; throughout the Konkan and North Kanara; in open situations on the Deccan trap in the Ahmednagar and Nasik districts; very common near Toranmal, 3700′ elevation in the Western Khandesh Satpudas. The climbing cylindrical stems are sometimes 9″ in diameter. Bark grey, corky. Wood porous, soft. The flowers appear in Apl. and May when the stems are leafless. The fresh foliage appears on long shoots during the latter part of May. The stems are bare of leaves from Oct. till May. Fruit May-June. The Khandesh Bhils eat slices of the refreshing juicy tuberous roots.

17. SPATHOLOBUS, HASSK.

Large woody climbers. Leaves pinnately trifoliate, stipellate. Flowers small, in large, terminal panicles, densely fascicled at the tumid nodes; bracts and bracteoles small. Calyx campanulate; teeth slender. Corolla exserted; keel straight. Stamens diadelphous; anthers uniform. Ovary sessile or stalked; ovules 2; style incurved; stigma capitate. Pod 1-seeded, winged, like that of *Butea;* seed apical.

Pod broad, rusty-tomentose, stalked	...	... S. Roxburghii.
Pod glabrescent, narrower, sessile	...	... S. purpureus.

1. S. Roxburghii, Benth. Pl. Jungh. 238; Fl. Br. I. 2, 193; Brandis For. Fl. 143; Cooke Fl. Pres. Bomb. 1, 370; Gamble Ind. Timb. 243; Brandis Ind. Trees, 229; *Butea parviflora,* Dalz. & Gibs. Bomb. Fl. 71. *Phulsun,* M.

A large climber. Leaves trifoliate; leaflets obovate, acuminate, obtuse at the base; end-leaflet obovate, rhomboidal, 6″-8″ by 4″-5·5″, subcoriaceous, grey-canescent beneath, glabrescent above; lateral unequal-sided; petioles 4″-6″ long. Panicles densely-pubescent, 12″-18″ long. Calyx ·25″ long, densely-velvetty. Corolla white, exserted, ½ as long again as the calyx. Pod stalked, 3″-6″ by 1″-1·25″, densely-tomentose towards the seed end; lower-side slightly curved.

From the Himalayas to Ceylon, Assam, E. Bengal, Chittagong and Burmah; throughout the mixed deciduous, monsoon-forests of the Konkan and N. Kanara, common in the Supa and Yellapore "Teak" area, where it does considerable damage to the growing stock. An immense, lofty climber with fluted stems often 12″ to 18″ in diameter. Bark dark-coloured, rough. Wood dark-brown, very soft, with numerous pores and concentric, alternate layers of wood and bast. The latter exude a bright red, transparent gum. "The seeds yield an oil and the bark a coarse fibre." Gamble.

2. S. purpureus, Benth. MSS.; Fl. Br. I. 2, 194; Cooke Fl. Pres. Bomb. 1, 370; Brandis Ind. Trees, 230.

Fig 230. Spatholobus purpureus, Benth.

A robust climber, glabrous throughout. Leaves petioled; petioles 2·5″ long; end-leaflet ovate, bluntly-acuminate; lateral slightly unequal-sided, sub-coriaceous, about 4″ by 2″; dark-green above; paler beneath; lateral-nerves about 7 pairs. Panicles terminal or axillary, densely branched. Calyx finely pubescent; teeth ½ as long as the tube. Corolla dark-purple. Pod sessile, falcate, quite glabrous, 4″ by ·75″; seed-end more distinctly veined than the thin, tough wing.

Rain-forests of North Kanara along the Supa ghàts, rare; also found in the Konkan, (Stocks), probably endemic. Fl. C. S. Fr. Apl., May. A lofty climber.

18. BUTEA, Roxb.

Trees or climbing shrubs. Leaves large, trifoliate; leaflets stipellate. Flowers densely-fascicled, large, showy, in racemes or panicles. Calyx broadly-campa-

nulate; teeth short, deltoid. Corolla exserted; keel semicircular. Stamens diadelphous; anthers uniform, obtuse. Ovary sessile or shortly stalked; ovules 2; style filiform; stigma very small, capitate. Pod stalked, compressed, thin, membranous, splitting round the small, apical seed.

An erect tree	1.	B. frondosa.
A climbing shrub	2.	B. superba.

Fig 231. Butea frondosa, Roxb.

1. B. frondosa, Roxb. Fl. Ind. 3, 244; Dalz. & Gibs. Bomb. Fl. 71; Fl. Br. I. 2, 194; Brandis For. Fl. 142; Bedd. Fl. Sylv. 176; Cooke Fl. Pres. Bomb. 1, 371; Gamble Ind. Timb. 243; Brandis Ind. Trees, 230. *Bengal Kino, Butea Gum, Bastard Teak; Tesa-ka-jhar,* H.; *Muttala, muttugal,* K.; *Phulas,* M.; *Phullas kakria,* Guz.

Young parts downy or tomentose. Leaves petiolate; petioles 4″-6″ long; leaflets coriaceous, hard, adpressed-hairy beneath; terminal-leaflet broad, obovate; base cuneate, as long as broad; lateral smaller, obliquely-ovate, 4″-6″ by 3″-4″; lateral-nerves strong, 4-8 pairs; venation reticulate, prominent; stipules linear-lanceolate, deciduous. Flowers large, fascicled, in rigid racemes, 6″ long; pedicels twice the calyx. Calyx ·5″ long, velvetty outside, silky-hairy within. Corolla 1·5″-2″ long, bright orange-red, thickly tomentose without; standard 1″ across; keel semicircular, beaked. Pod stalked, 6″-8″ by 1·5″-2″, argento-canescent, pendulous, thickened at the sutures; seed oval, flat, brown-shining, about 1·5″ by 1″.

Tropical India, Burmah and Ceylon, extends as far north as the Jhelum in the N. W. Himalaya; throughout the presidency, common in mixed monsoon-forest, ascends to 3700′ in the Khandesh Akrani. Fl. March. Fr. June-July.

A moderate-sized, deciduous tree often with an irregular, crooked trunk. Bark ash-coloured, rough, undulated; inner-bark fibrous, and spongy. Wood dirty-white, soft, not durable except under water; weighs 35 lbs. to the cub. ft. Yields a gum, sold as *Bengal kino* and used as a dye and tan. The fibre from the inner-bark is strong and useful. The leaves serve as plates and also for making native umbrellas. The seeds are used in native medicine as an anthelmintic and purgative. Important as a foster tree for the lac insect and the quantity of lac produced on *Butea* is stated to be greater than on any other tree. *Butea* presents a very distinctive and characteristic appearance during the hot season when it is bare of leaves and in flower or fruit.

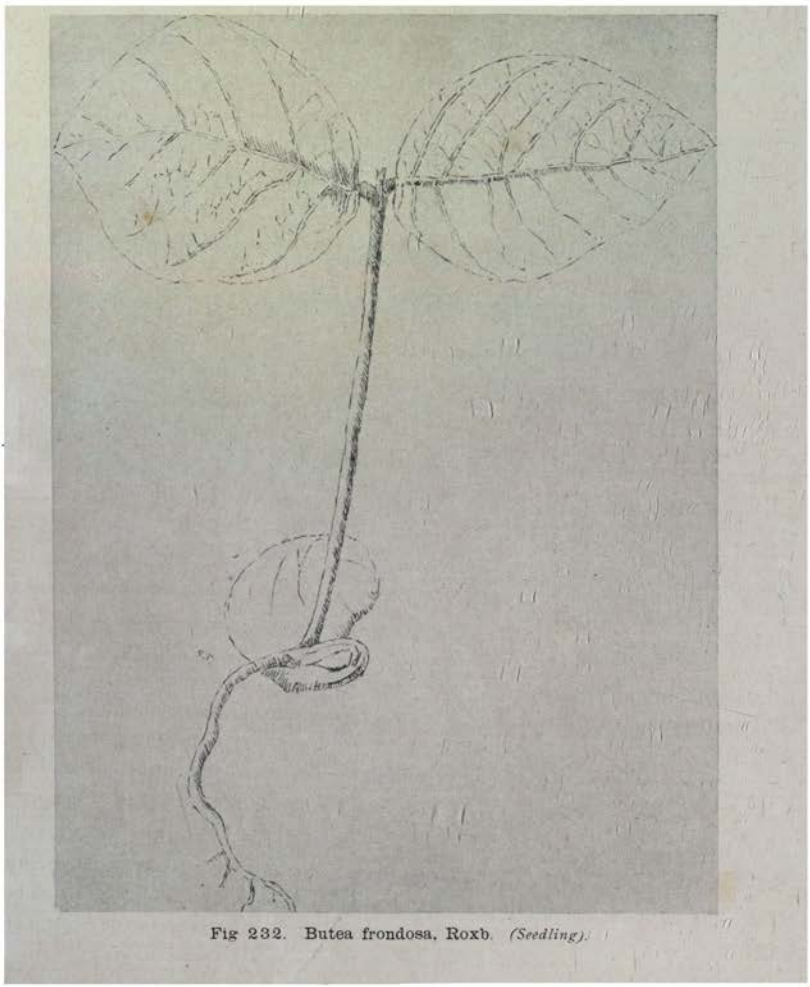


Fig 232. Butea frondosa, Roxb. *(Seedling).*

2. B. superba, Roxb. Fl. Ind. 3, 247; Fl. Br. I. 2, 195; Dalz. & Gibs. Bomb. Fl, 71; Brandis For. Fl. 143. *Palas-vel, beltivas,* M.

Leaflets and flowers somewhat larger than in *Butea frondosa.* Pod distinctly stalked.

Central Provinces, Central India, Bengal, Burmah. In the moist forests of the North Kanara. Fl. Mch. "Bark dark-brown, fibrous. Wood dark-brown, porous and fibrous." Gamble. Differs from *B. frondosa,* in its scandent, climbing habit.

19. ATYLOSIA, W. & A.

Erect or twining herbs or shrubs. Leaves usually pinnately trifoliate, gland-dotted beneath. Flowers axillary or racemed. Calyx-teeth distinct, longer or shorter than the tube. Corolla more or less exserted; standard with inflexed auricles at the base; keel not beaked. Stamens diadelphous; anthers uniform. Ovary sessile; ovules 3 or more; style filiform, glabrous; stigma capitate. Pod linear or oblong, compressed, with transverse lines between the seeds; seeds with a divided strophiole.

Petals persistent. *(Atylia.)*
- Erect shrubs. Flowers in sessile pairs.
  - Pod thinly-pilose ... ... 1. A. lineata.
  - Pod densely-pilose ... ... 2. A. sericea.
- Twiner. Flowers in peduncled racemes. Pod grey-canescent, not viscidly hairy ... ... 3. A. crassa.

Petals caducous. *(Cantharospermum.)*
- Pod viscidly hairy ... ... 4. A. gœnsis.

1. A. lineata, W. & A. Prodr. 258; Fl. Br. I. 2, 213; Cooke Fl. Pres. Bomb. 1, 382; *Cajanus lineatus,* Grah.; *Atylosia Lawii,* Wgt. Ic. 93; Dalz. & Gibs. Bomb. Fl. 74. *Ran-toor,* Vern.

A low, much-branched shrub with long, sulcate branches, densely grey-pubescent. Leaves trifoliate; petioles ·25″-·5″ long, terete, pubescent; petioles very short or 0; stipules ·25″ long, setaceous, hairy; leaflets obovate-oblong, apiculate, triple-nerved, coriaceous, densely grey-downy beneath, ultimately glabrescent above; pairs of flowers sessile. Calyx densely downy, ·2″ long. Corolla yellow, 3-times as long as the calyx. Pod oblong, ·5″-·75″ by ·25″, 2-3-seeded, finely pilose; seeds black; strophiole divided.

Hills of the Western Peninsula, from the Konkan southwards, ascending to 6000′ on the Bababuden Hills of Mysore. Very common in the moist forests along the Konkan and North Kanara ghâts. Fl. Nov.-Dec. Fr. Jan.

2. A. sericea, Benth. MSS.; Fl. Br. I. 2, 213; Cooke Fl. Pres. Bomb. 1, 383. Erect shrub with long, straight, terete branches, densely clothed with subpatent, silky hairs; stipules setaceous, ·25″-·5″ long. Leaves trifoliate, sub-digitate; petioles ·25″-·75″ long; petiolules very short or O; leaflets flexible, moderately-thick, subdigitate, oblanceolate, apiculate, 6-times as long as broad, triple-nerved, ·5″-1·75″ by ·25″, persistently densely grey-silky. Pairs of flowers sessile. Corolla red, small, 3-times the calyx; keel with a short beak. Pod oblong, oblique at the tip, densely pilose, 2-seeded, ·4″ by ·25″, turgid; seeds black; strophiole divided.

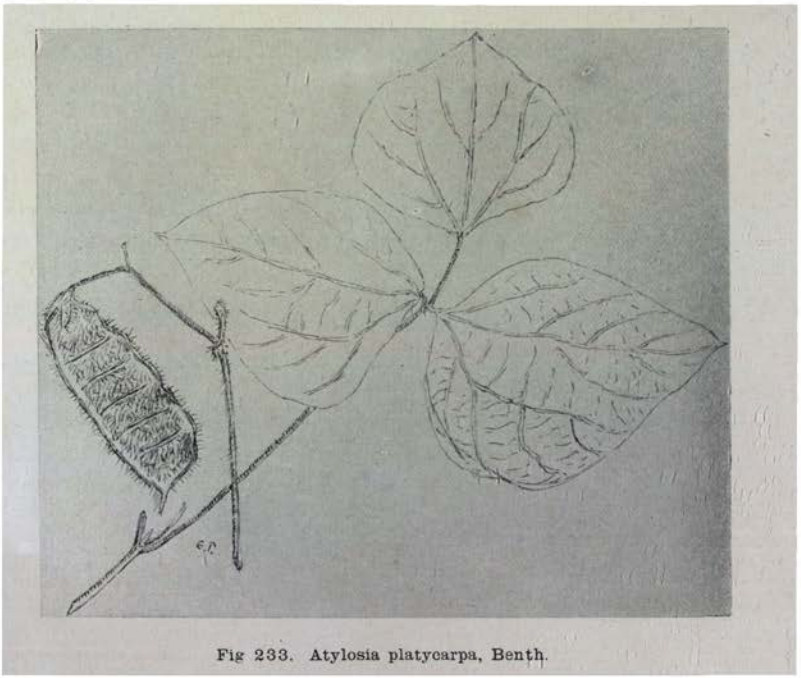


Fig 233. Atylosia platycarpa, Benth.

Himalayas from Garwal, Kumaon to Nepal; Konkan and Deccan; common on the high trap hills of the West Khandesh Akrani at 3700′ altitude, also found on the laterite of the Mahableshwar plateau. This species which is closely allied and connected by intermediate forms with *A. lineata*, appears to be confined in this presidency to the higher northern hills. In the Akrani it is found in open savannah mixed with long grasses. Two kinds of leaves occur on the tall unbranched stems. At the ends of the stems the leaflets are normally, lanceolate-acute, further down the leaflets are short, thick and obcordate. Fl. and Fr .C. & H. seasons.

A. platycarpa, Benth. as illustrated above is a twining herb with characteristic lineate pods found in moist situations in the Konkan and Deccan.

3. A. crassa, Prain Jour. As. Soc. Beng, 66, (1898) 45 and 432; Cooke Fl. Pres. Bomb. 1, 383; *A. mollis,* Benth. Pl. Jungh. 243; Fl. Br. I. 2, 213; *Cajanus glandulosus,* Dalz. & Gibs. Bomb. Fl. 73.

A grey-downy firm, branched, twining shrub; stipules minute, caducous. Leaves trifoliate; petioles 1·5″-2·5″ long, pubescent; end leaflet 2″-4″, coriaceous, shortly pilose, obovate, cuspidate, narrowed to a rounded base; petiolules of end leaflet ·3″ long, of lateral very short. Racemes 2″-3″ long, short-peduncled; pedicels ·25″-·5″ long, geminate; bracteoles large, reddish. Calyx ·4″ long. Corolla yellow, twice the calyx. Pod straight, obliquely-depressed between the seeds, 1″-2″ by ·6″, persistently grey-canescent, 4-9-seeded.

South Konkan. Stocks; a very rare species.

4. A. gœnsis, Dalz. & Gibs. Bomb. Fl. 73; Cooke Fl. Pres. Bomb. 1, 384; *A. barbata,* Baker in Fl. Br. I. 2, 216; Talb. Trees Bomb. Pres. 134.

A woody twiner with densely pubescent branches; all parts except corolla clothed with long, fulvous hairs; stipules ·25″ long, lanceolate, caducous. Leaves pinnately trifoliate; petioles 1·5″-2″ long; leaflets ovate, rounded, shortly acuminate, sub-coriaceous, thinly pubescent on both sides and with wax-like glands beneath; petiolule of end-leaflet ·5″-1″ long, of lateral very short; stipels .25″ long, minute, setaceous. Racemes 4″-6″ long, axillary and terminal, peduncled, longer than the leaf; rachis densely pilose; bracts ovate, cuspidate, exceeding the buds. Calyx ·5″ long; teeth lanceolate, standard ½ as long again as the calyx; keel equalling the calyx, ·5″ broad. Pod straight, densely grey viscid-hairy, 5-6-seeded, narrowed at both ends, obliquely-depressed between the seeds; seeds ·15″ long, black.

A twining shrub, very rare in the Bombay Presidency; found in the Konkan and Southern Mahratta country by Dalzell but apparently not seen by subsquent observers. Assam, Burmah, W. Peninsula and Java.

20. DUNBARIA, W. & A.

Woody twiners. Leaves pinnately trifoliate; leaflets stipellate, gland-dotted beneath. Flowers in axillary racemes. Calyx-teeth long and narrow. Corolla persistent, exserted; standard auricled at the base. Stamens diadelphous; anthers uniform. Ovary sessile; ovules numerous; style beardless; stigma capitate. Pod linear, flat, compressed, lineate or not between the seeds, few-seeded; seeds with an expanded membranous funicle, scarcely strophiolate.

Petals persistent.	Pods densely-hairy	....	1. D. Heynei.
Petals caducous.	Pods glandular-pilose	...	2. D. glandulosa.

1. D. Heynei, W. & A. Prodr. 258; Trimen Fl. Ceyl. 2, 80; Cooke Fl. Pres. Bomb. 1, 386; *Atylosia kulnensis,* Dalz. in Jour. Linn. Soc. XIII, 186; Fl. Br. I. 2, 214; Talb. Trees Bomb. Pres. 134; *Cajanus kulnensis,* Dalz. & Gibs. Bomb. Fl. 72.

A woody twiner, much branched, more or less clothed with long, spreading, ferruginous hairs; stipules ovate-lanceolate, thin, persistent, ·25″ long. Leaves trifoliate; petioles 1″-2·5″ long; leaflets very oblique, rhomboidal, acuminate, mucronate, membranous, minutely scabrous above, ferruginous-hairy on the nerves beneath; blade about 2″-3″ by 1·25″-2″; petiolules very short, hairy, stipulate, persistent. Racemes lax, axillary, few-flowered. Calyx ·5″ long, downy. Corolla purple, ½ as long again as the calyx. Pod 1·5″ by ·5″, 5-6-seeded, obliquely-lineate, covered with ferruginous hairs; seeds ovoid, reniform, mottled black and brown.

Fairly abundant in some of the rain-forests of the Konkan and N. Kanara, also found in Mysore and Ceylon.

2. D. glandulosa, Prain in Jour. As. Soc. Beng. 66, 433; Cooke Fl. Pres. Bomb. 1, 385; *Atylosia rostrata,* Fl. Br. I. 2, 216; Talb. Trees Bomb. Pres. 134; *A. glandulosa,* Dalz. in Jour. Linn. Soc. 13, 185; *Cajanus glandulosus,* Dalz. & Gibs. Bomb. Fl. 73.

A woody climber; branches glabrescent. Leaves pinnately trifoliate; stipules minute, caducous; petioles 1″-3″ long; leaflets exstipellate, roundish, coriaceous, 1·75″-3″ by 2″-3·5″, narrowed to a deltoid point, suddenly narrowed in the lower third; petiolule of terminal leaflet 1″ of lateral ·12″ long. Racemes longer than the leaves. Flowers large, showy, usually in pairs along the glabrous, terete rachis. Calyx ·4″ long with a few glandular bristles. Corolla 1″ long; keel broad, beaked; limb of standard 1·25″ broad. Pod linear, 2·5″-3, by ·4″, distinctly lineate between the seeds, thinly clothed with stiff, grey bristles springing from bulbous bases, 8-10-seeded; seeds with a thickened funicle.

A rare species in the Bombay Presidency found by Stocks and Dalzell in the N. Konkan, also distributed throughout C. India, Burmah and the W. Peninsula.

Cajanus indicus, Spreng. Syst. 3, 248; Fl. Br. I. 2, 217; Dalz. & Gibs. Bomb. Fl. Suppl. 24. *Pigeon Pea; Toor; dhal,* Vern.

An erect shrub. Leaves trifoliate. Flowers racemed. Calyx-tube campanulate, teeth short. Corolla exserted; keel truncate. Stamens diadelphous; anthers uniform. Style long-filiform, upcurved; stigma capitate. Pod linear, torulose with oblique, linear depressions between the non-strophiolate seeds.

Cultivated throughout the Presidency. A doubtful native of India. De Candolle in his 'Origin of cultivated Plants' thinks it is a native of tropical Africa introduced about 3000 years ago into India.

21. CYLISTA, Ait.

Climber. Leaves pinnately trifoliate; leaflets stipellate, gland-dotted beneath. Flowers in axillary racemes; bracts membranous, caducous. Calyx-tube campanulate; teeth obtuse, scarious, accrescent. Corolla yellow, not exserted; keel much incurved. Stamens diadelphous; anthers uniform. Ovary sub-sessile; ovules 1-2; style long, filiform; stigma capitate. Pod small, oblique, oblong, enclosed in the calyx.

C. scariosa, Ait.; DC. Prodr. 2, 410; Fl. Br. I. 2, 219; Dalz. & Gibs. Bomb. Fl. 74. *Ran-ghevdà,* Vern.

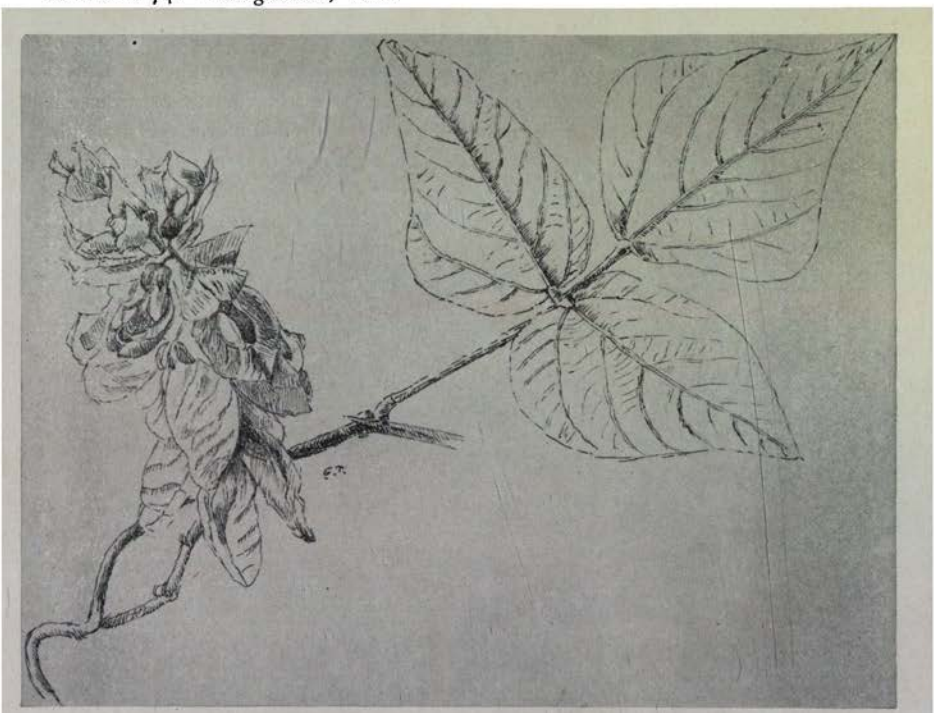


Fig 234. Cylista scariosa, Ait.

A twining woody shrub. Leaves trifoliate; petioles ·5″-2″ long; leaflets sub-coriaceous 2″-4″ by 1·5″-2·25″, ovate or rhomboidal, bluntly acute or emarginate, densely and softly tomentose beneath, thinly grey-tomentose above. Flowers in distinctly peduncled lax or dense racemes; bracts large, membranous, ovate, caducous. Calyx accrescent, scarious, conspicuously veined, 1″-1·25″ long; lower lip boat-shaped about 1″ broad. Corolla reddish-yellow, included,

about ·5″ long. The large scarious calyx is very characteristic and separates *Cylista* from *Rhynchosia*.

Western peninsula from the Konkan southwards; Deccan (common on the Anjini hill, Nasik district, at 4000′) Orissa; S. India and Burmah; throughout the presidency in open places in deciduous monsoon-forests, often in hedges. Fl. and Fr. cold season, Nov.-Mch.

22. RHYNCHOSIA, Lour.

Erect or twining under-shrubs. Leaves pinnately trifoliate, gland-dotted beneath; stipules ovate or lanceolate. Flowers axillary or racemed, solitary or twin, along the rachis, rarely solitary in the leaf-axils; bracts caducous. Calyx-tube short; teeth sometimes broad foliaceous. Corolla included, or exserted; keel incurved not beaked. Stamens diadelphous; anthers uniform. Ovary subsessile; ovules 2; style long, filiform; stigma capitate. Pod usually continuous between the seeds, deeply torulose, flat and turgid; seeds 2, arillate.

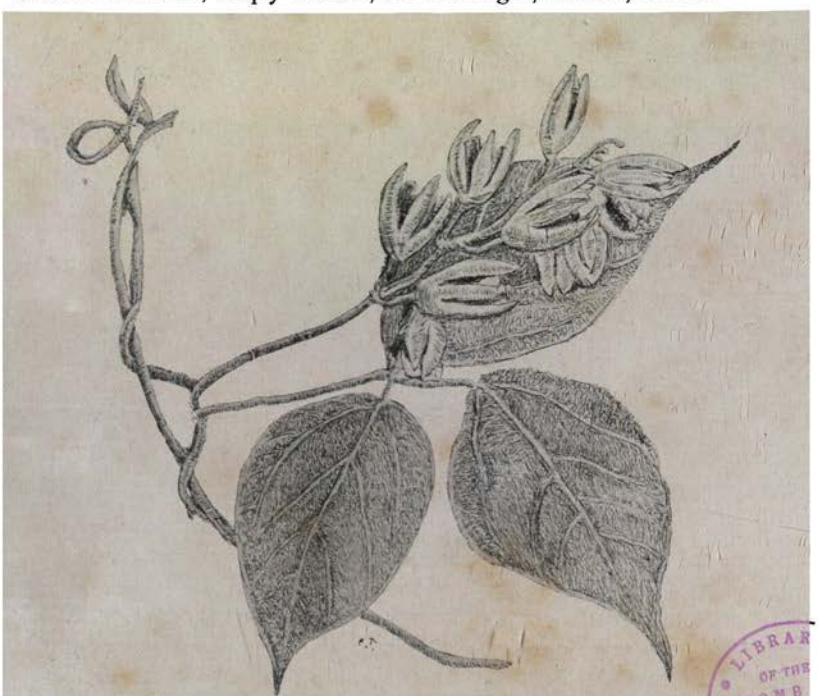


Fig 235. Rhynchosia cyanosperma, Benth.

R. cyanosperma, Benth. in Oliv. Fl. Trop. Africa 2, 218; Fl. Br. I. 2, 222; Cooke Fl. Pres. Bomb. 1, 388; Trimen Fl. Ceyl. 2, 84; *Cyanospermum tomentosum,* W. & A.; Dalz. & Gibs. Bomb. Fl. 75.

A robust, twining shrub; stems clothed with greyish pubescence. Leaves trifoliate; leaflets thick, densely clothed on both sides with grey-pubescence, rhomboid-ovate, cuspidate, 4″-6″ by 3″-4″; lateral oblique, base rounded; petioles stout, 4″-5″ long. Racemes peduncled, 6″-12″ long; bracts large, round, cuspidate, caducous, Calyx grey-tomentose, ·75″ long; tube short; teeth 3 times as long as tube, obtuse, ·2″ broad. Corolla red, included. Pod ·5″ by ·25″, torulose, as long as the calyx; seeds large, rounded, shining, metallic violet-black. The obtuse, hairy, linear, long calyx-teeth contrasting with the corolla as well as the metallic coloured seeds are characteristic of the species.

Forests of the Western peninsula and Ceylon, Eastern Tropical Africa and the Mascarene Islands; rain-forests of the South Konkan and North Kanara, nowhere abundant. Fl. and Fr. C. S.

23. FLEMINGIA, Roxb.

Shrubs, usually erect. Leaves simple or digitately trifoliate, gland-dotted beneath; stipules lanceolate, ribbed, deciduous. Inflorescence various, spikate, capitate or paniculate; bracts various; bracteoles O. Calyx-tube short; teeth narrow, acute, lowest usually free, longest and falcate. Corolla usually not exserted; petals equal in length; keel obtuse or slightly rostrate. Stamens diadelphous; anthers uniform. Style filiform; stigma capitate. Pod small, oblong, turgid, usually 2-seeded; seeds thick without a strophiole; funicle centric.

Leaves simple.
- Flowers in small cymes, each in the axil of a folded, persistent bract ... ... 1. F. strobilifera.

Leaves trifoliate; bracts lanceolate, not folded.
- Flowers in axillary, short racemes.
  - Low shrub; stems very short. Calyx-teeth obliquely campanulate, ribbed; teeth as long as the tube 2. F. nana.
  - Tall, erect shrubs.
    - Calyx-tube distinct; lowest tooth longest. Corolla exserted ... ... 3. F. congesta.
    - Calyx-tube very short; teeth subequal. Corolla included ... ... 4. F. Wallichii.
- Flowers in dense, globose, bracteate heads... ... 5. F. involucrata.
- Flowers in lax, slender racemes, in pairs at the ends of the long branches ... ... 6. F. tuberosa.

F. bracteata, Wight Ic. t. 268, considered as a variety of *F. strobilifera*, R. Br. by Baker in the Fl. Br. I. has been restored to specific rank by Prain, in Journ. As. Soc. Beng. 66, 227. It differs principally in having obtuse, hairy bracts and in the colour of the flowers. A very rare twining plant found by Dalzell in the Khandesh district on the banks of the Girnar river.

F. lineata, Roxb. Hort. Beng. 56, is a small, erect shrub of the dry open Deccan, Southern Mahratta country and Guzerat plains and in no way a forest species.

1. F. strobilifera, R. Br. in Ait. Hort. Kew Ed. 2. IV, 350; Fl. Br. I. 2, 227; Cooke Fl. Pres. Bomb. 1, 390; Dalz. & Gibs. Bomb. Fl. 75. *Kankuti,* Vern.

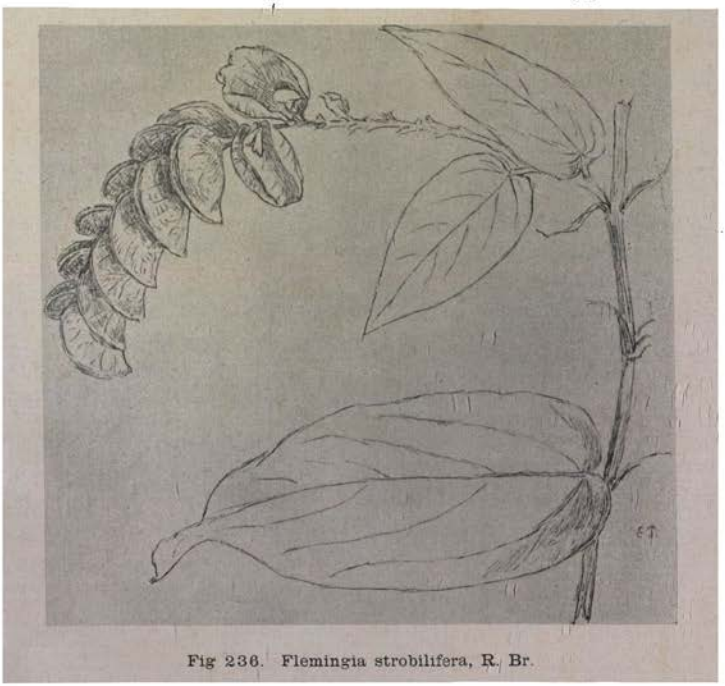


Fig 236. Flemingia strobilifera, R. Br.

An erect shrub; branches slender, more or less tomentose. Leaves simple, ovate-oblong, acute, rounded at the base or somewhat cordate, subcoriaceous, glabrescent above, thinly silky on the raised nerves beneath; lateral-nerves 8-10 pairs, prominent beneath, lowest basal; blade 1/5″-7″ by ·5″-3″; petioles ·2″-1″ long; stipules scarious, linear, about ·4″ long. Racemes on a zig-zag, densely-tomentose rachis; bracts large, folded, ·5″-1·5″ long, membranous, reddish-coloured, veined, cordate, broader than long, somewhat downy. Flowers 2 or

more hidden in each bract. Calyx ·25″ long; teeth lanceolate, veined. Corolla purple, scarcely exserted. Pod oblong, turgid, finely downy, 2-seeded, about ·4″ long, concealed by the bracts; seeds 2, dark-brown, marbled.

Himalayas from Simla to Assam, Khasia, Siam, Malacca and Ceylon; throughout the monsoon-forests of the Konkan and North Kanara. Bracts often with sterile flowers. Fl. and Fr. R. and C. S.

2. F. nana, Roxb. Hort. Beng. 56; Fl. Ind. 3, 339; Wight Ic. t. 389; Prain, in Jour. As. Soc. Beng. 66, 441; Cooke Fl. Pres. Bomb. 1, 391; *F. congesta,* Roxb. Var. *nana;* Fl. Br. I. 2, 228.

Fig 237. Flemingia nana, R. Br.

A small shrub; branches from a woody, underground stem, round, striate, lenticellate, glabrous. Leaves 3-foliate; petioles ·5″-1·5″ long, narrowly-winged, grey, adpressed-hairy; stipules ·25″-·5″ long, linear-lanceolate, longitudinally striate, caducous; leaflets 1″-4″ by ·5″-1·80″, elliptic, obovate, obtuse or acute, glabrous above, pubescent on the nerves beneath; lateral oblique, 3-basal-nerved; nervation very strong beneath. Flowers in axillary or terminal, congested, slender racemes 3″-4″ long; pedicels very short, glandular-pubescent; bracts ·1″ long, caducous. Calyx-tube obliquely broadly campanulate, glabrescent,

almost ribbed; teeth triangular-acute as long as the tube; lowest longest, minutely glandular-pubescent. Corolla ·2″ long, pink; keel hooded. Pod ·3″ long, oblong, turgid, covered with small, reddish glands; seeds 2, round, black, shining.

This species is quite distinct from *F. congesta,* Roxb. in habit shape and vestiture of calyx. It was considered a variety of *F. congesta,* by Baker in the Fl. Br. I. but has been restored to specific rank by Prain in Jour. As. Soc. Beng. 66, 445. Found in open situations in the deciduous monsoon-forests of N. Kanara, associated with *Desmodium gangeticum, Crotalaria dubia,* etc. Fl. and Fr. during the hot season from Mch. till May.

3. F. congesta, Roxb. Hort. Beng. 56; Fl. Ind. 3, 340; Var. *viridis,* Prain in Jour. As. Soc. Beng. V. 66 (1898), 440; Cooke Fl. Pres. Bomb. 1, 392; Trimen Fl. Ceyl. 2, 87; Fl. Br. I. 2, 228; exclud. varieties; Dalz. & Gibs. Bomb. Fl. 75; *Dow powla,* Vern.

An erect, woody shrub. Leaves trifoliate; leaflets strongly 3-basal-nerved, oblong-acuminate; terminal cuneate at base; lateral unequal-sided, silky on the nerves beneath, subcoriaceous, 4″-6″ by 2″-2·5″; stipules linear, ·5″ long, caducous; petioles 1″-4″ long, sulcate, not winged; petiolules very short, hairy. Racemes congested, 1″-2″ long, densely-flowered; bracts lanceolate, ·3″ long, silky, deciduous. Calyx ·4″ long; tube distinct, teeth linear, acute, longer than tube, densely brown-silky hairy. Corolla reddish, scarcely exserted. Pod oblong, turgid, apiculate, pubescent and glandular, ·4″ by ·3″, 2-seeded; seeds black, smooth; Var. *viridis* is the common forest-species in the Konkan and N. Kanara.

Central Himalayas to Ceylon and Malacca; throughout the Presidency, very common in the monsoon-forests of the Konkan and North Kanara. Flowers throughout the year. A low, diffuse undershrub.

4. F. Wallichii, Wight & Arn. Prodr. 242; Fl. Br. I. 2, 229; (exclud. syn. *F. nana* and *F. sericans*); Cooke Fl. Pres. Bomb. 1, 393.

A small, erect shrub, 3′ high; branches hirsute, angled. Leaves trifoliate; petioles ·5″-1·5″ long, slightly winged at the top; stipules small, acute, caducous; leaflets ovate, acute or obtuse at the apex, cuneate at the base, subcoriaceous, glabrous above, grey-tomentose beneath, 1·25″-4″ by ·60″-1·75″; nervation prominent beneath; stipules O. Flowers sessile, in dense axillary, condensed racemes; bracts short, acute, shaggy. Calyx-teeth linear, ·5″ long, plumose and glandular; tube very short. Corolla included. Pod ·5″ long by ·25″ broad, turgid, obtuse at tip with a small beak, finely pubescent, more or less covered with black glands; seeds 2, subglobose, black.

Burmah, Western peninsula; common in the deciduous monsoon-forests of

the Konkan and N. Kanara in open situations. Flowers and fruit during the hot season from March till May.

5. F. involucrata, Benth. Pl. Jungh. 246; Fl. Br. I. 2, 229; Cooke Fl. Pres. Bomb. 1, 393.

An erect shrub, with few branches, about 4′ high, often gregarious; branches downy; stipules large, scarious, caducous. Leaves digitately trifoliate; leaflets oblong-lanceolate, narrowed at both ends, 2″-3″ by ·75″-1·25″, subcoriaceous, grey-downy beneath. Heads of flowers large, terminal and axillary, about 1″ across, surrounded by 10-12 scarious, persistent, lanceolate, acuminate bracts, each ·5″ long. Calyx ·5″ long, divided nearly to the base; teeth cuspidate, covered with shaggy, grey hairs. Corolla included. Pod small, ·25″ by ·12″, included, downy, 1-seeded; seed ellipsoid, black, filling the pod.

Var. *viridis; F. semialata,* Wall. Cat. 5746 D. (not at all of Roxb.); *F. semialata,* Var. *viridis,* Kurz in Jour. As. Soc. Beng. V, 45 part 2, (1876), 261. Petioles distinctly winged. Leaflets thinner and paler. Racemes shorter than the petioles. Prain has restored to specific rank *F. semialata,* Roxb. a Nepal plant with racemes longer than the petioles which was reduced to a variety of *F. congesta,* Roxb. by Baker in the Fl. Br. I. and included the present variety *viridis.*

Eastern Himalayas, Assam and Sikhim. In the moist monsoon-forests of the Konkan and North Kanara. A gregarious shrub growing in open forest glades. Fl. R. S. Fr. Nov.-Feb.

6. F. tuberosa, Dalz. in Kew Jour. Bot. 2, 34; Dalz. & Gibs. 75; Fl. Br. I. 2, 230; Cooke Fl. Pres. Bomb. 1, 394.

A low shrub with perennial, tuberous roots; stems 2′-3′ long; branches long, slender, terete, sparsely clothed with spreading hairs. Leaves trifoliate, 1″-2″ long; petioles 1″-2″ long, sparsely hairy; stipules ·12″ long, acute, caducous; leaflets 1·5″-2″ by ·5″-·6″, lanceolate-acute, sparsely hairy on the nerves above and below, ciliate on the margins, dark-green above, pale and gland-dotted beneath. Flowers in slender, lax, axillary racemes, longer than the leaves, in pairs at the ends of the slender, yellowish-hairy branches; bracts and bracteoles rigid, ovate, acute. Calyx-teeth linear, ·5″ long, subequal, acute, covered with long, yellowish hairs springing from glandular bases. Corolla lilac, slightly exserted; standard patently yellow-hairy on the back. Pods oblong, as long or longer than the calyx, glabrous; seeds 1-2.

Apparently endemic in the moist, monsoon and rain-forests of the Konkan and N. Kanara. The tubers are said to be edible. Flowers during the monsoon in September.

24. DALBERGIA, LINN. F.

Trees or climbers. Leaves alternate, imparipinnate; leaflets usually alternate. Flowers copious, small, in terminal or lateral panicles; bracts small, subpersistent; bracteoles usually minute. Calyx campanulate; teeth 5, short, distinct, lowest usually the longest, Corolla exserted; standard broad; keel obtuse. Stamens 9-10, monadelphous or in 2 bundles of 5 each. Ovary stalked, ovules few; style short, incurved; stigma capitate. Pod thin, flat, indehiscent, few-seeded. Seeds flat, compressed, kidney-shaped.

Stamens 9 (less commonly 10) in one bundle; sheath of filaments only split at the top. Pod straight, thin, 1-4-seeded. *(Sissoa.)*
- Trees with large leaflets.
  - Leaflets 3-5, acuminate-cuspidate ... 1. D. Sissoo.
  - Leaflets 5-7, obtuse or emarginate ... 2. D. latifolia.
- Scandent shrub with 5-7, very unequal-sized leaflets ... ... 3. D. rubiginosa.
- Scandent shrubs with many, small leaflets.
  - Pod crescent-shaped, 1-seeded ... ... 4. D. torta.
  - Pod oblong, long-stalked, 1-seeded ... 5. D. Stocksii.
  - Pod oblong, short-stalked, 1-3-seeded ... 6. D. sympathetica.
  - Pod strap-shaped, long-stalked, 1-3-seeded 7. D. tamarindifolia.

Stamens in 2 bundles of 5 each. Pod thin straight, 1-3-seeded *(Dalbergaria.)*
- Trees.
  - Leaflets with prominent, parallel nerves. Standard with a callosity at base of limb 8. D. lanceolaria.
  - Leaflets with reticulate venation. Standard without a callosity at base of limb ... 9. D. paniculata.
- A climber. Pod straight, thin, 1-2-seeded ... 10. D. volubilis.
- A spinous, erect shrub. Pod reniform, flat ... 11. D. spinosa.

1. D. Sissoo, Roxb. Fl. Ind. 3, 223; Fl. Br. I. 2, 231; Bedd. Fl. Sylv. 25; Brandis For. Fl. 149; Dalz. & Gibs. Bomb. Fl. Suppl. 24; Cooke Fl. Pres. Bomb. 1, 395; Gamble Ind. Timb. 247. The *Sissoo tree. Sissu tali,* Sind; *Tanach, shishma, sisma,* Guz.

A large tree; branches grey-downy. Leaves alternate, imparipinnate; petioles terete, downy when young; stipules lanceolate, caducous; leaflets 3-5, firm, glabrous, broad-ovate, acuminate-cuspidate, 1·5″-2·5″ by 1·25″-2″. Flowers sessile,

in axillary panicles, shorter than the leaves; branches densely-pubescent; bracts linear-subulate, hairy. Calyx ·2″ long; teeth short. Corolla yellowish, twice the calyx; standard with a long claw, the limb rounded. Stamens 9, in one bundle; sheath of filaments slit at top. Pod strap-shaped, pale-brown, glabrous, 1·5″-4″ by ·25″-·5″, stipitate, 2-3-seeded.

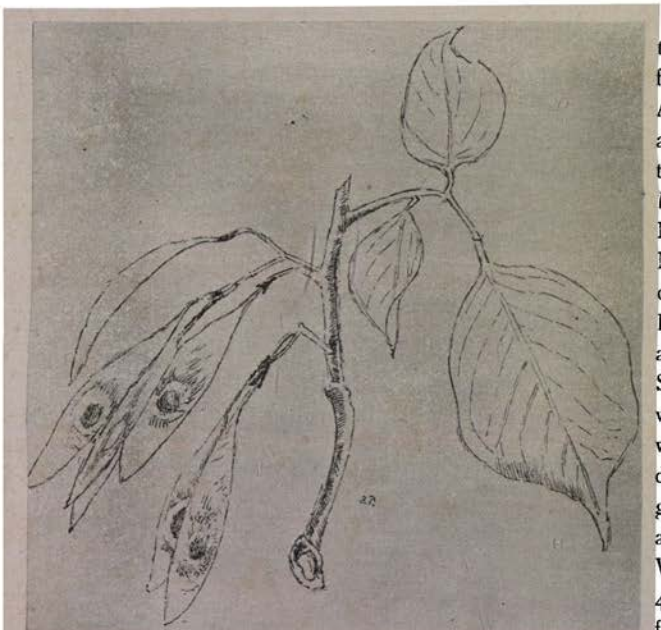


Fig 238. Dalbergia Sissoo, Roxb.

Sub-Himalayan tract up to 3000′, from the Indus to Assam; planted and self-sown throughout the Presidency; *Fl.* Mch.-June. *Fr.* Nov.-Feb. A large, deciduous tree. Bark grey, exfoliating in strips. Sapwood small, white; heartwood brown with darker veins, close-grained, very hard and durable. Weighs about 45 lbs. to the cub. ft., elastic, seasons well. Used for boat building, gun-carriages, furniture and agricultural implements, suitable for railway-sleepers. "As a furniture-wood and for carving is probably the finest wood in India. The Simla and Saharanpur carvings are well known". Gamble. Young twigs and leaves often lopped for cattle-fodder.

2. D. latifolia, Roxb. Cor. Pl. 2, 7, t. 113; Fl. Ind. 3, 221; Fl. Br. I. 2, 231; Bedd. Fl. Sylv. t. 24; Dalz. & Gibs. Bomb. Fl. 77; Cooke Fl. Pres. Bomb. 1, 396; Gamble Ind. Timb. 250. *The Blackwood or Rosewood Tree* of Southern India. *Biti,* K.; *Shisham, sisu,* M.; *Sisali, kalaruk,* Kon.

A large, glabrous tree. Leaves 4″-5″ long; leaflets 5-7, orbicular, broad-ovate, obtuse or emarginate, 1·5″-2·5″ by 1·5″-2·5″, firm, dark-green above, glaucous beneath; lateral-nerves 5-6 pairs; petiolules ·25″ long. Flowers small, ·2″ long, white, scented, in lax, axillary panicles, shorter than the leaves; branches

sub-corymbose. Calyx ·2″ long; segments oblong-obtuse, glabrous, shorter than the tube. Corolla yellowish-white, twice as long as the calyx; petals clawed. Stamens 9 in one bundle; anthers yellow. Ovary glabrous; ovules 3-5. Pod firm, strap-shaped, not veined opposite the seeds, 1·5″-3″ by ·5″-·75′, 1-3-seeded; the position of the seeds clearly marked.

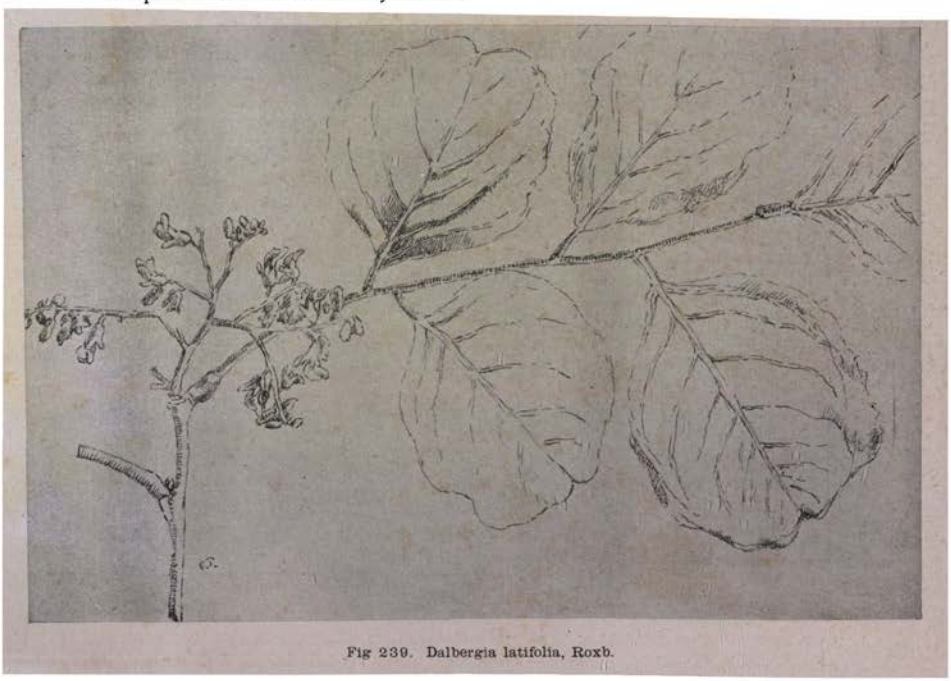


Fig 239. Dalbergia latifolia, Roxb.

Throughout the Indian peninsular area, Sikkim at the foot of the Himalaya and Oudh, Lower Bengal, Behar, Southern India and the Andamans, absent from Burmah and Ceylon. Indigenous in the dry "Savannah" forests of Khandesh on trap; ascends to 3700′ in the Akrani, found mixed with *Teak, Tewas, Bor* and other deciduous species, usually a small tree owing to the inhospitable conditions of soil and climate of this region. Attains to large dimensions in the mixed monsoon-forests of the Konkan and N. Kanara where it is sparingly but generally distributed, associated with *Teak* and *Bamboos*. *Shisham* is rarely found in the evergreen rain-forests of N. Kanara, it is reproduced readily from seed and root-suckers and coppices vigorously. In the Khandesh Satpudas I have observed how

well it withstands the influence of the annual forest fires. The old leaves are shed in March at the beginning of the "hot" season and the new foliage appears with the flowers in April and May in the dry parts of the area of distribution. In the moist monsoon-forests of N. Kanara and S. India *Shisham* is never quite bare of leaves and in Kanara it does not flower regularly or abundantly and as far as I know only in August. Beddome mentions in the Flora Sylvatica that the South Indian variety *"sissoides"* flowers in the rainy season during July. The fruit ripens from December to February. A large deciduous tree with a straight, cylindrical trunk; stems 60'-80' high and 4'-5' in diameter are not uncommon in some of the N. Kanara ghât forests. Bark ·5"-1" thick, cinerous, exfoliating in thin, fibrous, longitudinal flakes. Sapwood yellow, small; heartwood dark-purple with black streaks, very hard. No distinct annual-rings. Pores moderate-sized, often sub-divided in small groups; enclosed in narrow rings of white tissue, separate or joined by white, interrupted, wavy, concentric lines. Medullary rays fine, light-coloured, numerous. Weighs from 48 to 60 lbs. to the cub. ft. P=837 for the N. Kanara wood. Used for gun carriages, veneering, furniture, carving, agricultural implements, etc. The young twigs and leaves are much esteemed as cattle fodder in N. Kanara. Torches are made from pieces of the wood. Wounds in the white sap-wood exude a red-coloured gum.

3. D. rubiginosa, Roxb. Fl. Ind. 3, 231; Fl. Br. I. 2, 232; Cooke Fl. Pres. Bomb. 1, 397.

A scandent, unarmed climber; branches striate. Leaves imparipinnate, 3"-4" long; rachis pubescent; leaflets usually 5, unequal-sized, coriaceous, glabrous, green above, paler and minutely hairy beneath, ovate or obovate, obtuse, sometimes emarginate, 1"-2·5" by ·5"-1·25"; petiolules ·1" long, minutely tomentose. Flowers white, in crowded, axillary panicles, shorter than the leaves; branches finely pubescent; pedicels ·1" long; bracts ovate-oblong, pubescent on both sides, ciliolate. Calyx ·08" long, persistent, brown-pilose with a pair of minute persistent, ciliolate bracteoles; teeth obtuse. Corolla twice as long as the calyx; standard with a long claw and a round limb. Stamens 9 or 10 in one bundle. Pod 1-2-seeded, strap-shaped, glabrous, strongly veined, 1"-2" by ·5", acute at tip, narrowed at the base into a slender stalk ·2" long.

Western peninsula; in the rain-forests of North Kanara from the Ainshi and Coessi ghâts southwards. Fl. and Fr. at different times throughout the year.

D. confertiflora, Benth. Pl. Jungh. 1, 255; Fl. Br. I. 2, 233.

A scandent-climber with the habit of *D. sympathetica.* Leaves 4"-6" long; leaflets 11-15, oblong, obtuse, glabrous, 1"-2" long. Flowers in ample, terminal panicles; branches densely pubescent. Pod thin, glabrous, 1-2-seeded, brownish, 2"-3" by ·6"-·75", narrowed into a stalk ·5" long.

Oudh and Silhet also from the Konkan, but not noted by observers sub-sequent to Dr. Stocks. Not included in Dr. Cooke's Flora of the Bombay Presidency.

4. D. torta, Grah. in Wall. Cat. 5873; Cooke Fl. Bomb. Pres. 1, 397; *D. monosperma,* Dalz. in Kew Jour. Bot. 2, 36. Fl. Br. I. 2, 237; Dalz. & Gibs. Bomb. Fl. 78; Trimen Fl. Ceyl. 2, 89; *Karin-Tagera,;* Rheede Hort. Mal. 6, t. 55.

A stout, scandent shrub; branches hooked at their extremities. Leaves 2″-3″ long; rachis pubescent; leaflets 5-7, usually 5, elliptic-oblong, obtuse, mucronate, glabrous above, glaucous beneath, ·75″-1″ by ·5″-·6″; petiolules very short, pubescent. Flowers in axillary, solitary or twin, racemose panicles, much shorter than the leaves; bracts and bracteoles concave, minute, persistent. Calyx ·4″ long; teeth nearly equal, obtuse. Corolla white, twice as long as the calyx. Stamens 10 in one bundle. Ovary glabrous; ovules 2. Pods 1″ by ·5″, crescent-shaped, shortly-stalked, glabrous, shining, 1-seeded.

Rare in the Bombay Presidency; hills of the Konkan, Malvan, and near Vengurla, also in the Bengal Soonderbans and the Western peninsula near the coast; Ceylon, Malaya, Philippines, China and N. Australia. Fl. June.

5. D. Stocksii, Benth. in Jour. Linn. Soc. IV, Suppl. 42; Fl. Br. I. 2, 234; *D. Melanoxylon,* Guill. & Perr.; Fl. Senegal 1, 227, t. 53; Cooke Fl. Pres. Bomb. 1, 396.

A scandent, unarmed shrub; branches covered with brown tomentum. Leaves 4″-5″ long; stipules very caducous; leaflets 11-15, oblong, obtuse, thin, more or less hairy on both surfaces, dark-green above, much paler beneath, emarginate; petiolules ·1″ long. Flowers in copious, axillary panicles, as long as the leaves; branches densely corymbose at the top, the lower more distant. Calyx oblique, ·08″ long; teeth ½ as long as the tube. Corolla twice as long as the calyx. Stamens 9, monadelphous. Pods 1″-2·5″ long, thin, oblong, gradually narrowed into a long slender stalk, veined opposite the solitary seed which occupies a large proportion of the pod.

W. peninsula from the Konkan southwards on the ghâts; Konkan; N. Kanara. Fl. and Fr. C. and H. seasons.

Dalbergia melanoxylon, Guill. and Per. Fl. Seneg. v, 227, t. 53. *Chinese Blackwood* (Dharwar). An erect small tree, closely allied to the above (if not the same species) is a native of tropical Africa and is commonly planted along road sides and in gardens throughout the presidency.

6. D. sympathetica, Nimmo in Grah. Cat. Bomb. Pl. 55; Fl. Br. I, 2, 234; Dalz. & Gibs. Bomb. Fl. 78; Cooke Fl. Pres. Bomb. 1, 398; *D. multiflora,* Heyne; Prain in Jour. As. Soc. Beng. 70, 59. *Pendguliyel, yekyel,* M.; *Tilabli* Kon.; *Muldi,* K.

A large, scandent shrub; stems armed with long blunt or sharp, twisted or straight spines, 6″-10″ long. Leaves 4″-6″ long; rachis softly pubescent; leaflets 11-15, ovate-oblong, obtuse or emarginate, coriaceous, thickly covered with grey or brown-silky hairs especially beneath, ·6″-1″ by ·3″-·5″; petiolules ·1″ long. Panicles peduncled; the ultimate branches secund, corymbose. Calyx ·08″ long, with a pair of obtuse, hairy, adpressed bracteoles. Corolla twice as long as the calyx. Stamens 10, monadelphous, deeply divided into 2 bundles of 5 each. Ovary pubescent. Pod thin, strap-shaped, apiculate, 2″-4″ by ·75″-1″, 1-3-seeded, thinly brown-tomentose, the place of the seed distinctly marked; stalk short.

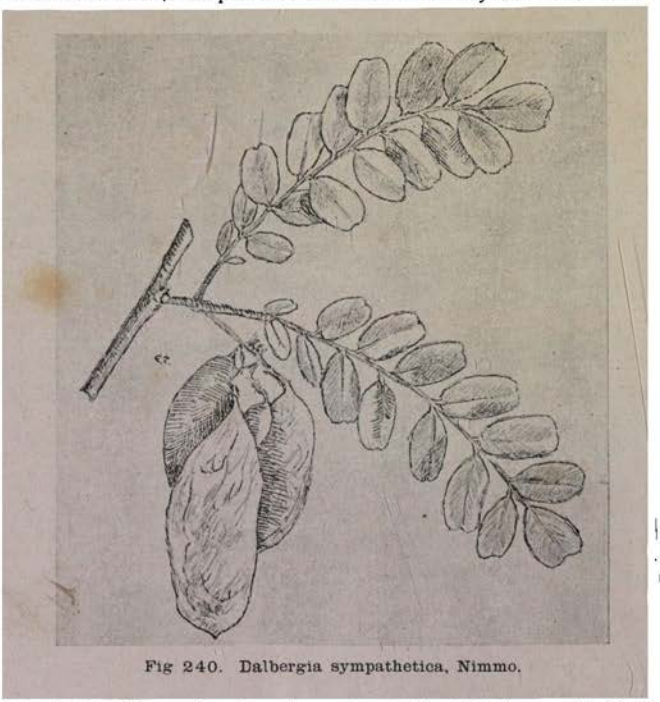


Fig 240. Dalbergia sympathetica, Nimmo.

Ghâts of the W. peninsula; throughout the Konkan and North Kanara from the coast inland in deciduous forests. Fl. and Fr. Jan.-Feb. A densely branched climber. Stem 4″ in diameter, armed with great hooked and twisted spines, often 3-5 together from thickened parts of the stem. Bark smooth; inner-bark red, juicy, ·25″ thick. Wood white, fibrous.

7. D. tamarindifolia, Roxb. Fl. Ind. 3, 233; Fl. Br. I. 2, 234; Cooke Fl. Pres. Bomb. 1, 398; Brandis Ind. Trees, 234.

A scandent climber; branches densely brown-tomentose. Leaves about 4″

long; rachis densely puberulous; leaflets 25-41, crowded, trapezoid, oblong, firm, densely clothed with brown tomentum or glabrous, ·5″-1″ by ·25″-·5″, nearly sessile, obtuse or emarginate. Flowers in short, congested, axillary panicles, 1″-2″ long, densely brown-pubescent; bracts and bracteoles minute, persistent. Calyx ·08″ long; teeth short, obtuse. Corolla white, ·25″ long; standard orbicular, with a claw as long as the tube of the calyx. Stamens 9, monadelphous. Ovary glabrous; ovules 2-3. Pod 1″-1·5″ by ·6″, thin, strap-shaped, glabrous, sometimes bright-brown, usually with a slender, filiform stalk 1″ long; seeds 1-3, not conspicuous on the outside of the pod.

Eastern Himalayas, Nepal, Sikkim, etc., ascending to 4000 and southwards to Malacca; W. peninsula.

There are two varieties of this species, Var. *pubescens*, more or less densely grey or brown-pubescent and Var. *acaciæfolia*,; *D. acaciæfolia*, Dalz. Kew Jour. Bot. 2, 37, with the leaflets quite glabrous, bright-green above and glaucous beneath. Both varieties are common in the rain-forests of the southern parts of the N. Kanara district. Fl. and Fr. Mch.-May.

8. D. lanceolaria, Linn.; DC. Prodr. 2, 417; Fl. Br. I. 2, 235; Dalz. & Gibs. Bomb. Fl. 78; Bedd. Fl. Sylv. 88; Brandis For. Fl. 151; Cooke Fl. Pres. Bomb. 1, 399; Trimen Fl. Ceyl. 2, 88; Gamble Ind. Timb. 253; Brandis Ind. Trees, 236. *Dandous, dandoshi*, M.; *Harrani, gengri*, Vern.

An erect tree with glabrous branches. Leaves 3″-6″ long; stipules minute, caducous; leaflets about 15, ovate or obovate, obtuse, emarginate, glabrous, dark-green above, much paler beneath, coriaceous, ·75″-1·5″ by ·5″-·75″; lateral-nerves numerous, parallel, prominent on the upper surface. Panicles clothed with rufous pubescence, large, lax, terminal and axillary, appearing when the tree is bare of leaves; branches silky or sub-glabrous. Flowers ·4″-·5″ long, in unilateral racemes on short, slender pedicels; bracts ·08″ long, caducous. Calyx as long as the bracts; teeth as long as the tube. Corolla 2-3-times as long as the calyx; standard with a large callosity at the base of the limb. Ovary stalked, hairy at the base. Pod 1·5″-4″ by ·5″-·75″, narrowed at both ends, glabrous, 2-3-seeded, long-stalked; seeds ·25″ to ·4″ long, oval, compressed.

Plains from the W. Himalayas to Ceylon. In the deciduous monsoon-forests of North Kanara from Mundgod to Siddapur, common. 'Konkan and Khandesh', Dalz. Fl. Mch.-May. Fr. ripe next cold season and remains long on tree. A large, deciduous tree. Bark ·25″ thick, grey, smooth; exfoliating in thin, rounded patches. Wood white or grey, moderately-hard, not durable. Pores scanty, large or moderate-sized, enclosed in and joined by concentric, irregular bars of white tissue. Medullary rays fine, short, white, distinct. Weighs about 50 lbs. to the cub. ft.

9. D. paniculata, Roxb. Fl. Ind. 3, 227; Fl. Br. I. 2, 236; Dalz. & Gibs. Bomb. Fl. 78; Brandis For. Fl. 151; Bedd. Fl. Sylv. 88; Cooke Fl. Pres. Bomb. 1, 399; Gamble Ind. Timb. 254; Brandis Ind. Trees, 236. *Passi, padri,* Vern.; *Phansa,* M.; *Hasrgurgia, husrani,* K.

A large, deciduous tree; branchlets brown-silky pubescent; leaflets 9-15, obtuse, nearly glabrous, turning black in drying, somewhat hairy beneath; no prominent lateral nerves; venation reticulate. Panicles terminal and axillary, congested, densely brown-silky pubescent, much smaller than in *D. lanceolaria.* Flowers blueish, crowded on short, unilateral racemes; bracts oblong, early deciduous. Calyx ·12″ long, nearly sessile, densely pubescent; teeth acute. Corolla twice as long as the calyx; standard oblong, emarginate, without a callosity at the base of the limb; keel much shorter than the other petals. Stamens in 2 bundles of 5 each. Pod similar to that of *D. lanceolaria,* narrowed at both ends, 1-2-seeded.

N.-W. Himalaya from the Jumna to Oudh, C. and S. India; common in the plains and subalpine dry monsoon-forests of the Madras Presidency. W. peninsula; in the deciduous forests of the Konkan and North Kanara, fairly common in the Kalghatgi taluka of Dharwar. A large deciduous tree, with an irregularly fluted trunk. Bark grey, smooth, thin, with horizontal cracks. Wood pale, yellowish-white of an abnormal structure. Annual-rings separated by broad concentric layers of soft-bast tissue. Pores moderate-sized, often subdivided. Medullary rays fine, numerous. Rejected as firewood by the villagers in the Belgaum and Kanara Districts, also by the S. Mahratta Railway company as locomotive-fuel. Fl. April-May, simultaneously with the new foliage. The name "*padri*" is from the Mahratti for layer and refers to the wood structure.

10. D. volubilis, Roxb. Fl. Ind. 3, 231; Fl. Br. I. 2, 235; Dalz. & Gibs. Bomb. Fl. 78; Brandis For. Fl. 152; Gamble Ind. Timb. 254; Cooke Fl. Pres. Bomb. 1, 400; Brandis Ind. Trees, 237. *Alei,* Vern.; *Mardiballi, kabbali,* K.

A climbing, unarmed shrub with green, glabrous, circinate branches. Leaves 4″-6″ long; rachis pubescent; leaflets 11-13, thin, glabrous, oblong or ovate-oblong, obtuse, apiculate, 1″-2″ by ·75″-1″; terminal largest; petiolules ·05″ long. Flowers in large, leafless, terminal and axillary, bracteate, cymose panicles, 8″-12″ long with corymbose branches, densely clothed with brown pubescence; pedicels very short; bracts and bracteoles small, ovate, ciliolate. Calyx ·1″ long, densely velvetty; teeth minute. Corolla pale-lilac, 2-3-times as long as the calyx. Stamens 10 in 2 bundles of 5 each. Ovary stipitate; ovules 2-3. Pod 2″-3″ by ·75″-1″, linear-oblong, obtuse, stalked, 1-2-seeded, glabrous, thickened and veined opposite the seeds.

Throughout the moist monsoon and rain-forests of the presidency, common. Fl. Feb.-Mar. Fr. Apl.-May. Quite distinct from *D. sympathetica.* Often when

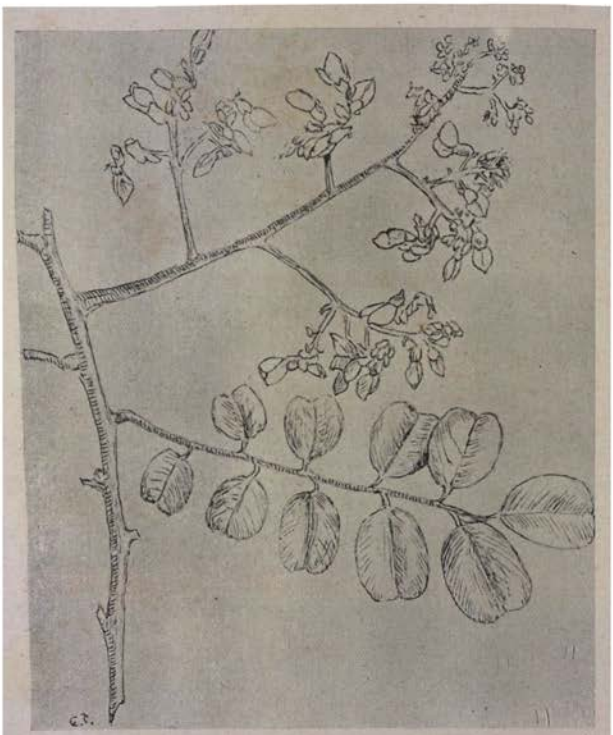


Fig 241. Dalbergia volubilis, Roxb.

young grows gregariously as an erect shrub. Normal climbing stems unarmed, deeply fluted, 3″-8″ in diameter with circinate, green branches. Bark smooth, inner yellowish, turns reddish-brown on exposure. Wood yellowish or reddish-grey, smooth, compact. Annual-rings distinct. Pores small, uniform, scanty. Medullary rays very fine and close, crossed by concentric, continuous, rather broad bands of light-coloured tissue.

II. *D. spinosa*, Roxb. Fl. Ind. 3, 233; Fl. Br. I. 2, 238; Cooke Fl. Pres. Bomb. 1, 400.

A stiff, erect, glabrous shrub with the horizontal branches spine-tipped at the ends. Leaves fascicled on the nodes of the branches; leaflets 7-11, obovate, ·25″-·5″ by ·12″-·25″. Flowers in congested, sessile, axillary panicles; pedicels short. Calyx ·1″ long, minutely downy; teeth short, obtuse. Corolla white, twice as long as the calyx. Pod 1″ long, brown, glabrous, reniform, flat.

This plant was included in my Trees, Shrubs, etc. of Bombay published in 1902 on the authority of Watt, Dict. Econ. Prod. 3, 15. I have never found it myself and there are no authentic specimens from the Bombay Konkan in the Kew herbarium.

"Frequent on the shores of the Eastern and Western Peninsulas and at Chittagong." Watt, Dict. Econ. Prod. l. c.

25. PTEROCARPUS, Linn.

Trees. Leaves pinnate; leaflets alternate, coriaceous, exstipellate. Flowers moderate-sized, yellow, in racemes or lax panicles; pedicels articulated at the

apex. Calyx turbinate, curved; teeth short, equal. Petals exserted, with long claws, those of the keel free. Stamens united in one bundle or in two distinct bundles, the 10th filament frequently free; anthers versatile. Ovary sessile or stalked; ovules 2; style incurved; stigma terminal. Pod indehiscent, orbicular, winged, 1-seeded; radicle short, incurved.

P. Marsupium, Roxb. Fl. Ind. 3, 234; Fl. Br I. 2, 239; Bedd. Fl. Sylv. t. 21; Dalz. & Gibs. Bomb. Fl. 76; Brandis For. Fl. 152; Cooke Fl. Pres. Bomb. 1, 401; Gamble Ind. Timb. 261. *Bijasal*, Hind.; *Netra, hond, honne*, K.; *Asan, bibla*, M.; *Bia*, Bhil.

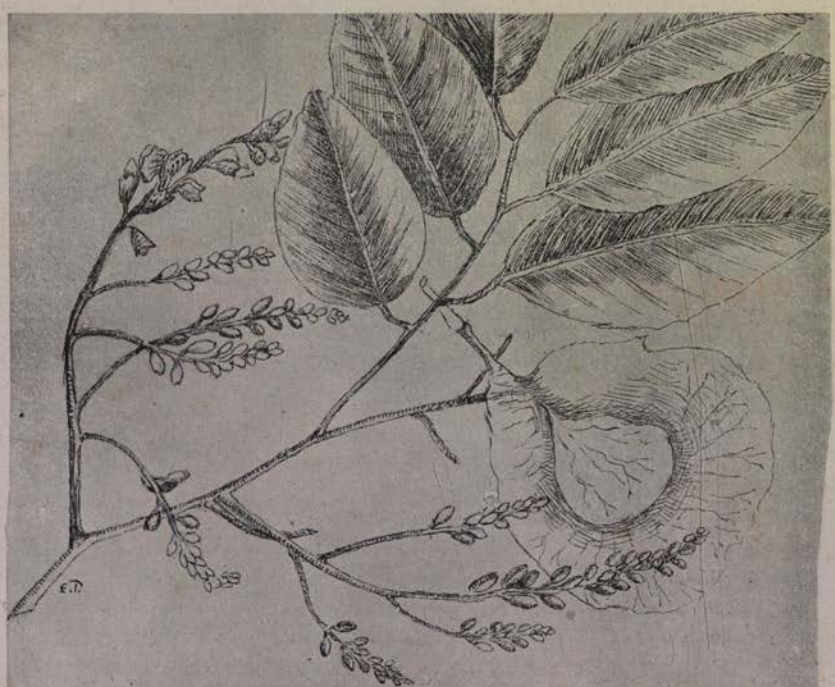


Fig 242. Pterocarpus Marsupium Roxb.

A large deciduous tree with spreading branches. Leaves 6″-8″ long; leaflets 5-8, coriaceous, elliptic, obtuse, or acuminate, dark-green and glossy above, paler beneath, 3″-5″ by 2″-3″; lateral-nerves numerous and prominent. Flowers ·5″ long, pale-yellow, in short, axillary, panicled racemes, shorter than the leaves; pedicels short, articulated close to the flower. Calyx ·25″ long, brown-hairy. Corolla twice as long as the calyx; petals on long claws, those of the keel free

or slightly connate at the tips; lamina of petals waved or crisped on the margins. Stamens 10, monadelphous or deeply divided into 2 bundles of 5 each. Ovary shortly-stalked; ovules 2. Pod usually 1-seeded, obliquely-orbicular, 1″-2″ in diameter, glabrous; wing veined.

There are two varieties of this species. Var. *A*. Leaves elliptic, 2-lobed. Fruit sometimes over 2″ across. Var. *B*. Leaves cuspidate or acuminate and to which latter variety our Bombay tree belongs.

Western Peninsula from the Konkan southwards, Ceylon. Throughout the presidency in deciduous monsoon-forest, scattered but not gregarious, ascends to 3700′ in the Khandesh Akrani, common in North Kanara. Very large trees are numerous in some of the Mysore forests. Yields a very valuable timber which contains a gum-resin, "*Kino*" of commerce. Fl. May-June. Fr. Dec.-March. A large, deciduous tree often with a crooked stem. Bark ·3″ thick, grey, exfoliating in small, irregular-sized pieces. Wood brown, hard, durable. Pores moderate-sized and large. Medullary rays short, very fine and numerous, crossed by numerous close wavy, light-coloured, concentric lines. Weighs about 50 lbs. to the cub. ft.; seasons well; full of gum-resin which stains the wood when damp. An excellent and valuable timber used for many purposes, considered to be the next best wood after Teak and Blackwood in N. Kanara and the Konkan.

26. PONGAMIA, VENT.[1]

A tree. Leaves imparipinnate; leaflets opposite, exstipellate. Flowers axillary, racemed. Calyx campanulate, nearly truncate. Corolla exserted; standard broad; keel obtuse. Stamens monadelphous; anthers oblong, versatile. Ovary subsessile; ovules 2; style incurved; stigma capitate. Pod woody, indehiscent, 1-seeded; seed reniform, thick.

P. glabra, Vent. Jard. Malm. t. 28; Fl. Br. I. 2, 240; Dalz. & Gibs. Bomb. Fl. 77; Bedd. Fl. Sylv. t. 177; Brandis For. Fl. 153; Gooke Fl. Pres. Bomb. 1, 402; Gamble Ind. Timb. 262. *Koorangal, kanaga, honge,* K.; *Karanj,* M.

A moderate-sized tree. Leaves 5″-9″ long; rachis glabrous; leaflets 5-9, opposite, glabrous, bright-green, shining on both surfaces, ovate, acute or shortly acuminate, base acute or rounded, 2″-5″ by 1″-3″; lateral-nerves 6-8 pairs, prominent beneath; petiolules thick, ·25″ long. Flowers white and purple, in short, axillary racemes, fascicled along a glabrous or pubescent rachis; pedicels slender, ·3″ long, articulated; bracteoles minute, ovate, acute. Calyx ·12″ long, brown-pubescent. Corolla ·5″ long; standard suborbicular; claw very short. Pod indehiscent, turgid, oval-oblong with a short decurved lateral beak, 2″ long by 1·25″ broad, glabrous; stalk thick, ·5″ long.

Fig 243. Pongamia glabra, Vent.

From the Himalayas to Ceylon and Malacca. Throughout the presidency in moist situations along rivers and nalas; often planted as a road-side tree, grows readily from cuttings; very common near the sea-coast in tidal and beach forests. Fl. May-June. Fr. next April. A moderate-sized, nearly evergreen tree. Bark soft, grey, covered with tubercles. Wood moderately hard, white, turning yellow on exposure, not durable. Annual-rings indistinct. Pores medium-sized, included in and joined by irregular, concentric bands of white tissue. Medullary rays fine, conspicuous. Weighs about 40 lbs. to the cub. ft. Used for oil-mills, fuel, etc. The seeds yield a red-brown oil used for burning and native medicinal purposes, chiefly as an application for skin diseases.

27. DERRIS, Lour.

Usually robust climbing shrubs, rarely trees. Leaves imparipinnate, usually exstipellate. Flowers showy, copious, fasciculate or on tumid nodes along the rachis, in axillary or terminal racemes; bracts and bracteoles small, caducous.

Calyx campanulate, nearly truncate. Corolla much exserted; standard broad; keel-petals slightly cohering. Stamens usually monadelphous; anthers versatile. Ovary sessile; ovules few; style filiform; stigma capitate. Pod indehiscent, winged along one or both sutures.

Flowers in axillary racemes, fascicled on short nodes along the rachis. Pod winged along the upper seminiferous suture.
- Pod 1-3-seeded, narrow, strap-shaped ... ... 1. D. scandens.
- Pod usually 1-seeded, suborbicular or broadly-oblong ... ... 2. D. uliginosa.

Flowers in large axillary or terminal panicles. Pod winged along both sutures.
- Leaflets few. Standard without callosities at the base of the limb.
  - Stamens monadelphous.
    - Pod glabrous, shining ... ... 3. D. Heyneana.
    - Pod persistently brown-silky ... ... 4. D. brevipes.
  - Stamens diadelphous ... ... 5. D. platyptera.
- Leaflets many. Standard with 2 callosities at the base of the limb ... ... 6. D. canarensis.

1. D. scandens, Benth. in Jour. Linn. Soc. IV. Suppl. 103; Fl. Br. I. 2, 240; Brandis For. Fl. 154; Cooke Fl. Pres Bomb. 1, 404; Brandis Ind. Trees, 241; Trimen Fl. Ceyl. 91; Gamble Ind. Timb. 263; *Brachypterum scandens,* Dalz. & Gibs. Bomb. Fl. 76.

A very large, scandent shrub; branches closely covered with reddish-coloured, round lenticels; young parts pubescent. Leaves 3″-6″ long; leaf-rachis deeply channelled; stipules small, pubescent; leaflets opposite, 5-19. rigid, coriaceous, glabrous shining, 2·5″-1″ by 1·5″-·4″, (lowest pair smallest), elliptic, obovate-acute or bluntly acuminate, emarginate, reddish adpressed-hairy on the nervation beneath; petiolules channelled above. Flowers small, in peduncled, axillary racemes, 10″-18″ long; pedicels slender, fascicled on nodes along the rachis; bracteoles 2, minute, ovate, at the top of the pedicels. Calyx ·1″ long; teeth obsolete. Corolla ·3″ long, white or pink; standard ·25″ broad with a long claw. Ovary pubescent. Fruit 1″-3″ long by ·4″ broad, acute at both ends, pointed at the tips, somewhat thickened between the seeds, narrowly-winged along the upper suture, adpressed-hairy; seeds 1-4.

Eastern Himalayas, Bengal, Assam, Burmah and the Andamans; Western peninsula from the Konkan southwards to Ceylon, also found in the curious

Fig 244. Derris scandens, Benth.—*Fruit.*

swamp-forests of Burmah. Throughout the Konkan and North Kanara from the sea-coast inland, in moist monsoon and rain-forests; nowhere common. Fl. R. S. June-Aug. Fr. Sept. A handsome white-flowered climber; stems smooth, furrowed, 100′ long and 3″ in diameter. Bark greenish-grey, shining, lenticellate. Wood soft, in alternate concentric layers with and without pores. Pores large in radial lines between the broad medullary rays. The bark yields a coarse rope-fibre.

2. D. uliginosa, Benth. Pl. Jungh. 1, 252; Fl. Br. I. 2, 241; Dalz. & Gibs. Bomb. Fl. 77; Cooke Fl. Pres. Bomb. 1, 404; Gamble Ind. Timb. 263; Brandis Ind. Trees, 241; Kurz. For. Fl. 1, 339; Trimen Fl. Ceyl. 2, 92.

A stout, glabrous, evergreen climber with lenticellate branches. Leaves 5″-8″ long; rachis striate; leaflets 3-7, ovate or ovate-oblong, 4″-2·25″ by 2″-1·25″, acute or bluntly acuminate, sometimes emarginate, rounded or cordate at the base, coriaceous; venation minutely reticulate; petiolules ·12″-·25″ long, channelled, glabrous. Flowers with slender pedicels, ·12″ long, on shortly stalked, 1-several-flowered nodes, arranged in simple, axillary racemes 4″-6″ long. Calyx ·1″ long, thinly silky; teeth obsolete. Corolla ·3″ long, rose-coloured; standard ·5″ broad, ovate, emarginate. Stamens monadelphous. Ovary pubescent. Pod sessile, 1″-1·5″ by ·75″-1″, orbicular or oblong, thin, flat, glabrous and veined, narrowly winged along the upper suture, pale-yellow when ripe, 1-2-seeded; seeds kidney-shaped, compressed.

Eastern Himalayas, Western peninsula and Ceylon, Burmah in the fresh water swamp-forests, Eastern Africa to Western Polynesia; common in North Kanara and the Konkan along the banks of tidal rivers and near the coast. Fl. C. S. A large climber with thick stems. Bark dark greyish-brown, covered with many horizontal lenticels. "Wood brown, in irregular masses of wood containing pores separated by anastomosing belts of bast-tissue. Pores large often subdivided, numerous. Medullary rays numerous, bent round the pores." (Gamble)

3. D. Heyneana, Benth. Pl. Jungh. 1, 252; var. *paniculata,* Fl. Br. I. 2, 244; Dalz. & Gibs. Bomb. Fl. 77; Cooke Fl. Pres. Bomb. 1, 405; Brandis Ind. Trees, 242; *Pongamia paniculata,* Wight Herb. 920.

Fig 245. Derris Heyneana, Bth.–*Fruit.*

A stout, climbing shrub; branches striate, glabrous, sometimes ending in long, slender, puberulous, branched tendrils. Leaves pale-green, glabrous, 5″-8″ long; rachis striate, glabrous; leaflets usually 5, subcoriaceous, ovate or obovate, bluntly-acuminate, cuneate or rounded at the base, 6·5″-3″ by 2·5″-1·5″; lateral-nerves 6-8 pairs with fine, reticulate venation between; bracteoles 2, minute, situated just below the calyx. Panicles large, axillary, 6″-15″ long; flowers arranged in short, somewhat distant corymbs along the branches; rachis and its branches more or less rufous-pubescent. Calyx ·12″ long, finely brown-pubescent at length nearly glabrous; teeth shallow, ciliolate. Corolla ·5″ long, pink or rose-coloured; standard ·25″ broad, without callosities at the base. Stamens monadelphous. Ovary silky-hairy; ovules usually 4. Pod oblong, ovoid, obovoid or strap-shaped, 2″-4″ by 1″-1·5″ glabrous, reticulately veined, broadly-winged, along the upper suture, narrowly along the lower; seeds 1-3.

Western peninsula in rain-forest from the Konkan to Mysore and N. Kanara probably endemic. Fl. Jan.-March.

4. D. brevipes, Baker in Fl. Br. I. 2, 244; Cooke Fl. Pres. Bomb. 1, 406; *D. Heyneana,* var. *brevipes,* Benth in Jour. Linn. Soc. 4, Suppl. 110.

A stout climber; branches glabrous. Leaves 5″-8″ long, quite glabrous; leaflets 5-7, ovate or obovate, bluntly-acuminate, coriaceous, 2″-3·25″ by ·75″-1·5″; petiolules ·25″ long. Flowers numerous in long, axillary and terminal panicles, fascicled on short nodes along the rachis; bracteoles 2 close to the calyx. Calyx ·1″ long, densely-pubescent; teeth short, triangular, usually obscure. Corolla red, much exserted; keel pubescent; standard and wings glabrous. Stamens monadelphous. Ovary rufous-hairy at the base; stigma capitate. Pod broad, oblong, 1-seeded, 1·25″-1″ by 1″, persistently brown-silky with a narrow wing along the upper and a very obscure one along the lower suture. (Baker).

Konkan, Nilghiris and Mysore. Flowering specimens from the N. Kanara district collected on Dursing-gudda at an elevation of over 3000′ were in the absence of fruit doubtfully referred to the above by Sir G. King. Col. Prain however remarks on the same specimens "Quite agree with the species of *D. Heyneana,* in Herb. Wight." Until fruiting specimens of this plant are found in the Bombay Presidency it must remain a doubtful species. Fl. Feb.-April.

5. D. platyptera, Baker. Fl. Br. I. 2, 245; Cooke Fl. Pres. Bomb. 1, 407; *D. thyrsiflora,* Talb. Bomb. Trees 1st Ed. 77 (not of Benth); *D. Wallichii,* Prain in Jour. As. Soc. Beng. 5, 66.

A large, pubescent climber; branches rufous-pubescent, soon glabrous. Leaves 6″-9″ long; leaflets 5-9, coriaceous, glabrous, 4·5″-1·75″ by 2″-1″, oblong, subacute or shortly acuminate broadly rounded at the base; venation finely reticulate; petiolules ·25″ long. Flowers in large terminal or axillary, thyrsoid panicles with numerous, ascending, pubescent branches; pedicels very short, not fascicled; bracts and bracteoles very small, ovate acute, densely rufous-pubescent. Calyx ·15″ long, densely tomentose; teeth obscure. Corolla ·4″ long; standard without callosities at the base of the limb; claw short. Stamens diadelphous. Ovary hirsute. Pod 2″-4″ by 1·25″-1·5″, thin, oblong, acute at both ends, flat, glabrous, broadly winged along both the sutures, 1-seeded.

Southern ghâts of North Kanara, pretty common in rain-forest. Fl. Dec. Fr. Feb.

6. D. canarensis, Baker. Fl. Br. I. 2, 246; Cooke Fl. Pres Bomb. 1, 406; *Brachypterum canarense,* Dalz. & Gibs. Bomb. Fl. 76.

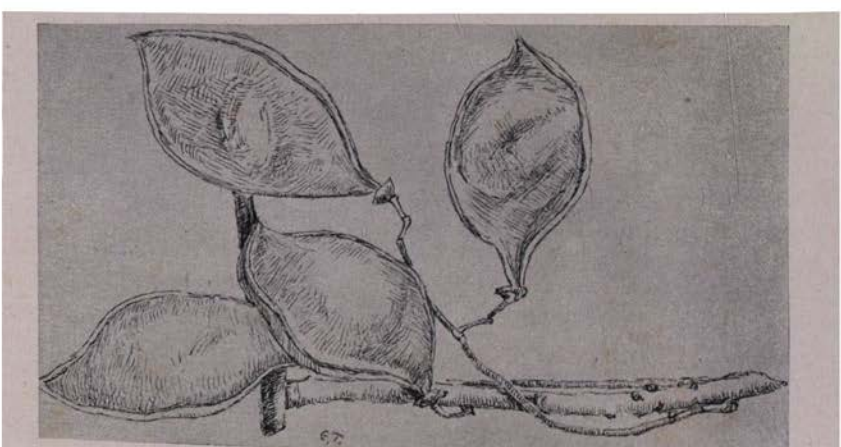


Fig 246. Derris canarensis, Baker.—*Fruit.*

A large climbing shrub; branches more or less lenticellate, striate, rufous-pubescent. Leaves about 9″ long; rachis tomentose; stipules ·1″ long, thick, red-tomentose; leaflets 15 to 21, 1″-2″ by ·35″-·6″, lanceolate or oblanceolate, obtuse or acute, dark-green, glabrous above, glaucous and glabrescent beneath, subcoriaceous; nervation obscure beneath; petiolules ·15″ long. Flowers pink, ·6″ long, in axillary racemes, shorter than the leaves, arranged in threes along the pubescent rachis on short nodes or branches; bracts minute, tomentose; bracteoles 2, inserted a little below the calyx. Calyx broad, cup-shaped, sparsely pubescent outside, hairy at the top within and ciliolate on the margins; teeth obsolete. Corolla ·3″ long, pink or rose-coloured, glabrous; standard with a short claw and 2 callosities at the base of the limb; keel and wing-petals with long claws. Stamens monadelphous. Ovary rufous- hairy at the base. Pod 2″ by ·75″, flat, elliptic, glabrous, 1-2-seeded, very narrowly winged along both sutures; the 2-seeded pods are constricted between the seeds.

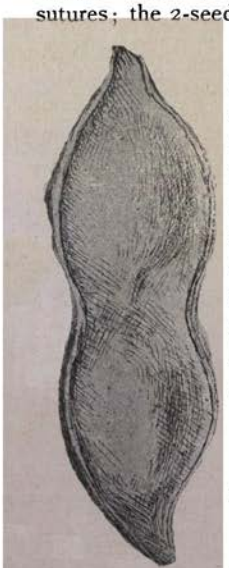


Fig 247.
D. canarensis, Baker. *(2-seeded fruit.)*

Along the ghâts of North Kanara from Ainshi to the Mysore frontier in rain-forest, locally common, probably endemic. Fl. H. S. Apl.-May. Fr. R. S. remains long on the stem. With reference to *D. oblonga*, Benth. in Jour. Linn. Soc. IV. Suppl. 112; Fl. Br. I. 2, 242; Cooke Fl. Pres. Bomb. 1, 405. Konkan, Stocks. Col. Prain remarks on specimems of *D. canarensis,* from N. Kanara "Exactly equal Ritchie's 1720, which is *D. canarensis*, but apparently also equal Thwaite's 1493 and Stock's 19, which are both *D. oblonga*, Benth." It is probable therefore that *D. oblonga,* Benth. and *D. canarensis*, Baker are identical; in which case the name *D. canarensis*, has priority

D. robusta, Benth. in Jour. Linn. Soc. IV. Suppl. 104; Fl. Br. I. 2, 241; Cooke Fl. Pres. Bomb. 1, 403; *Brachypterum robustum,* Dalz. & Gibs. Bomb. Fl. 77.

A deciduous tree of the outer Himalaya, from the Ganges eastwards to Assam, Eastern Bengal and Pegu. Given by Dalzell as indigenous in the Bombay Presidency, as it was found in Dr. Stock's herbarium. This tree has not been found in this presidency as far as I know since Dr. Stock's time.

28. SOPHORA, Linn.

Trees or shrubs. Leaves odd-pinnate; leaflets exstipellate. Flowers showy, racemed or panicled; bracts and bracteoles minute or O. Calyx oblique, broadly

campanulate; teeth deltoid, short. Corolla much exserted; petals equal, with long claws. Stamens free or obscurely connate at the base. Ovary shortly moniliform; ovules many; style incurved; stigma capitate. Pod moniliform, with turgid joints, usually indehiscent.

S. Wightii, Baker. Fl. Br. I. 2, 250; Cooke Fl. Pres. Bomb. 1, 407; Brandis Ind. Trees, 244; *S. heptaphylla*, Wight Icon. t. 1155 (not of Linn.); Dalz. & Gibs. Bomb. Fl. 79; Bedd. Fl. Sylv. 89.

A small tree or large shrub; branchlets persistently velvetty-brown pubescent. Leaves 6″-8″ long; stipules rigid, subulate; leaflets 11-15, subcoriaceous, 1·5″-3″ by ·5″-·75″ oblong, acuminate, green, glabrous above, thinly pubescent and glaucous beneath; lateral-nerves numerous, arching upwards; midrib fulvous-hairy beneath. Flowers in leaf-opposed racemes as long as the leaves; pedicels twice as long as the calyx; bracts subulate, ·25″ long. Calyx oblique at the mouth, ·25″ long, persistently finely silky-pubescent; teeth obscure. Corolla ·6″ long, yellow. Pod stalked, 3″-4″ long, firm, indehiscent, deeply constricted between the seeds, long-pointed at the apex; joints glabrous and strongly veined on the faces; seeds bright-red, shining.

Hills of the Western Peninsula; Mysore, Nilghiris, "Hills east of Belgaum." Dalz. A rare species.

29. CÆSALPINIA, Linn.

Trees or woody prickly-climbers. Leaves large, abruptly bipinnate. Flowers showy, yellow, in axillary racemes or panicles. Calyx deeply cleft with the lowest lobe cucullate. Petals spreading, orbicular, clawed. Stamens 10, free, declinate. Ovary sessile or subsessile; ovules few; style filiform, sometimes clubbed at the tip. Pod oblong or ligulate, armed or smooth, dehiscent or indehiscent.

Pod dry, armed with wiry prickles	... 1. C. Bonducella.
Pod dry, unarmed.	
Pod broad, glabrous, 1-seeded	... 2. C. Nuga.
Pod ligulate, glabrous, 4-8-seeded ...	... 3. C. sepiaria.
Pod inflated, bristly, 2-seeded	... 4. C. mimosoides.

1. C. Bonducella, Fleming in Asiat. Res. XI, 159; Fl. Br. I. 2, 254; Gamble Ind. Timb. 267; Cooke Fl. Pres. Bomb. 1, 410; Brandis Ind. Trees, 246; *Guilandina Bonducella,* Linn.; *G. Bonduc,* Dalz. & Gibs. Bomb Fl. 79, (in part). *Fever Nut; Physic Nut; Nickar, Sagargota, gaja, gutchka kachki, gajkai,* Vern.; *Karbat* in Sind.

A large, scandent, spreading, prickly shrub; branches armed with hooked and straight prickles. Leaves 12″ to 24″ long; petioles and rachis very prickly; stipules leafy, cut into large segments; pinnæ 6-8 pairs, 2″-3″ long, opposite, with pairs of hooked stipular-spines at the base; leaflets 6-9 pairs, ·75″-1·25″ by ·5″-·75″, thin, membranous, ovate, obtusely mucronate, glabrous above, puberulous beneath; petiolules very short; stipels of short, hooked thorns. Flowers in long-peduncled, simple or branched racemes, densely-flowered at the top, laxly lower down, 6″-12″ long; rachis densely brown-pubescent; pedicels ·2″ long in flower, longer in fruit, finely brown-downy; bracts squarrose, fulvous-hairy. Calyx ·25″ long, brown-hairy. Petals oblanceolate, yellow, scarcely exserted. Pod shortly-stalked, oblong, 2″-3·5″ by 1·75″, compressed and densely armed on the faces with sharp, wiry prickles, indehiscent; seeds 1-2, oblong, globose about ·75″ in diameter, lead-coloured; with a long funicle.

Throughout tropical India and Ceylon, the Bombay presidency in hedges and waste places, common near the sea-coast at Karwar. Fl. R. S. Fr. C. S. A large shrub with light brown-coloured bark. "Wood white, hard. Annual-rings distinct. Pores moderate-sized, single or in radial strings, surrounded by a white ring, between the fine wavy medullary rays." Gamble. All parts of the plant are used medicinally in Ceylon, principally by natives, as a substitute for quinine.

2. C. Nuga, Ait. Hort. Kew. 3, 32; Fl. Br. I. 2, 255; Cooke Fl. Pres. Bomb. 1, 411; Brandis Ind. Trees, 246; Trimen Fl. Ceyl. 2, 99; *C. paniculata,* Roxb.; Dalz. & Gibs. Bomb. Fl. 79. *Kaku-mulla,* Hort. Mal.

A large woody climber with slender, flexuous, glabrous branches, armed with very sharp, hooked, black prickles. Leaves 6″-12″ long; main rachis, cylindrical, smooth, polished, armed with distinct, hooked-prickles; pinnæ 3-4 pairs, 2″-3″ long with a pair of hooked-prickles at the base of each; leaflets 2-3 pairs, 1″-2″ by ·5″-1″, elliptic, acute or obtuse, glabrous, shining above, pale-yellowish beneath; petiolules ·1″ long. Flowers sweet-scented, in long, axillary or terminal racemes or panicles, 10″-15″ long; buds globose; pedicels ·5″ long, articulated above the middle. Calyx ·25″ long, glabrous, with broad, shallow segments. Corolla scarcely exserted, fragrant, yellow. Stamens little exserted; filaments woolly in the lower half. Pod broad-oblong, beaked, 2·5″ by 1·25″, dark-brown, hard and leathery, compressed, narrowed into a short stalk, tardily dehiscent; seed oval-rotund, ·75″ by 1″, dark-brown, smooth.

Eastern Bengal, Western peninsula, Andamans and Ceylon; common in salt marshes along the banks of tidal rivers and creeks near the coast of the Konkan and North Kanara. Fl. C. and R. S. Fr. remains long on plant.

3. C. sepiaria, Roxb. Hort. Beng. 32; Fl. Ind. 2, 360; Fl. Br. I. 2, 256; Dalz. & Gibs. Bomb. Fl. 80; Brandis For. Fl. 156; Cooke Fl. Pres. Bomb.

1, 412; Brandis Ind. Trees. 346; Gamble Ind. Timb. Tri267;men Fl. Ceyl. 2, 100. *The Mysore Thorn; Chillur, chillari,* M.; *Hotsige*, K.

Fig 248. Cæsalpinia sepiaria, Roxb.

A scrambling, spreading, woody-climber; branches downy, covered with small, yellow, hooked-prickles; stipules ·5″ long, obliquely ovate with crisped margins, acuminate, auricled at the lower angle of the base. Leaves large, 9″-15″ long; main rachis pubescent, prickly; pinnæ 5-10 pairs, subequal, 2″-3″ long with a slender, pubescent rachis; leaflets 6-9 pairs, ·5″-·75″ by ·15″-·20″, oblong, slightly oblique, pubescent on both sides, paler beneath; petiolules very short. Flowers large, in stout, simple, axillary or terminal racemes 6″-12″ long; pedicels ·5″-·75″ long, densely pubescent, articulate near the flowers; bracts ·4″ long, densely pubescent, ovate-lanceolate, caducous. Calyx ·5″ long, pubescent; sepals obtuse, reflexed. Corolla ·75″ to ·5″ across, bright-yellow; petals clawed, reflexed. Stamens slightly longer than the petals; filaments woolly in the lower half. Pod 3″-4″ by ·75″-1·1″, glabrous, obliquely-oblong, beaked, somewhat turgid, tardily dehiscent; seeds 6-8, greenish, mottled.

From the Himalayas to Burmah and Ceylon. In hedges throughout the dry districts of the presidency, very common in the Southern Mahratta Country. Fl. Feb.-May. Fr. Dec.-Jan. Bark yellowish-white, corky, thorny. Wood light-brown, hard. The bark is used for tanning. Makes impenetrable, dense fences.

4. C. mimosoides, Lam. III. t. 335. fig. 2; Fl. Br. I. 2, 256; Dalz. & Gibs: Bomb. Fl. 80; Cooke Fl. Pres. Bomb. 1, 412; Brandis Ind. Timb. 247. *Kenchigi-bally,* K.

Fig 249. Cæsalpinia mimosoides, Lam.

An erect or climbing, prickly gregarious shrub, sometimes forming low impenetrable thickets; branches reddish-coloured, covered with short, straight prickles and glandular bristles, emitting when bruised a pungent, peculiar medicinal odour which is specially strong in the pods. Leaves 12″ to 24″ long; main-rachis red, covered with curved sharp, glandular prickles; stipules ·4″ long, linear, acute, ciliate; pinnæ 10-30 pairs; rachis red, slender; leaflets 10-20 pairs, membranous, sensitive, ·25″-·4″ by ·12″, linear-oblong, obtuse, apiculate, rounded and somewhat oblique at the base, dark-green above, glabrous, pale beneath. Flowers in simple, lax, terminal or leaf-opposed racemes, 12″-24″ long; rachis clothed with prickles and glandular bristles; pedicels ·75″-1″ long, glandular-bristly. Calyx red, ·5″ long, downy with minute, glandular hairs; lobes obtuse, gland-dotted. Petals bright-yellow, scarcely exserted. Stamens with filaments flattened at the base and densely woolly in the lower half. Pods 1·5″-2″ long, oblong, beaked and truncate at the end, narrowed at the base, inflated, glandular-bristly; sutures not thickened; seeds 2.

Burmah, Western peninsula and Ceylon. Throughout the moist rain-forests of North Kanara and the Konkan, not found in the dry zone. Fl. cold season. Fr. May.

C. coriaria, Willd.; *Dividivi* or *American Sumach Tree*, is cultivated throughout the presidency in plantations, along road-sides and in gardens. *C. Sappan*, L.; *Sappan Wood Tree*. A small thorny tree of Southern India, Pegu, etc.; yields the valuable red dye used for colouring silk. The heartwood is red, lustrous and takes a fine polish. The dye is obtained from the pods and also from the heartwood cut into chips.

30 MEZONEURON, Desf.

Robust prickly climbers. Leaves abruptly bipinnate; stipules small or inconspicuous. Flowers yellow, zygomorphic, in large panicles. Calyx very oblique, tube short; lowest lobe hooded. Petals spreading, subequal, obovate. Stamens 10, free, declinate, exserted. Ovary sessile or shortly stalked; ovules few or numerous; style filiform, incurved with the stamens; stigma small, capitate. Pod flat, thin, broadly winged down the upper suture, indehiscent; seeds compressed, reniform; cotyledons flat; radicle short, straight.

M. cucullatum, W. & A. Prodr. 283; Fl. Br. I. 2, 258; Dalz. & Gibs. Bomb. Fl. 80; Cooke Fl. Pres. Bomb. 1, 414; Brandis Ind. Trees, 247; Gamble Ind. Timb. 269; *Cæsalpinia cucculata*, Roxb. Fl. Ind. 2, 358. *Ragi*, Vern.

Fig 250. Mezoneuron cucullatum, W. & A. *(Fruit).*

A large, prickly, glabrous climber; branches smooth, shining, armed with black, hooked prickles. Leaves bipinnate, 6″-12″ long; pinnæ 2-5 pairs, 5″-8″ long; rachis slender, armed with scattered, small, hooked prickles and a large stipular pair at the origin; leaflets 4-5 pairs, opposite or alternate, 3·5″-2″ by 1·5″-1″, ovate or ovate-oblong, abruptly acuminate, apiculate, glabrous, shining,

dark-green above, pale beneath, thinly coriaceous; nervation not prominent; petiolules ·10″ long, channelled. Panicles terminal and axillary, about as long as the leaves, consisting of a few, simple racemes; pedicels as long as the calyx, slender, articulated about the middle. Calyx yellow, ·4″ long; tube broad, shallow, oblique, leathery, glabrous, persistent; lobes imbricate, lowest cucullate, obtuse, ·4″ long. Corolla ·5″ across, yellow, streaked with red. Stamens 9 or 10 declinate, exserted; filaments pubescent at the base; anthers red, unequal. Ovary stipitate; ovules 1-2. Pod thin, glabrous, 1-seeded, oblong, 4″ by 1″, faintly reticulately veined; wing along the upper suture ·25″ broad; stalk ·1″ long, springing from the persistent calyx-tube; seed transversely compressed, reniform.

Eastern Himalayas from Nepal, ascending to 4000′ to the Khasia hills, Behar and the Western peninsula. In the rain-forests of the Konkan and North Kanara, abundant in the extreme south of North Kanara; also in the evergreen "Rais" near Khandalla and Lonawla. Fl. Nov.-Feb. Fr. March. A large, straggling, very thorny climber. Bark brown, covered with pairs of strong, hooked prickles from corky, tubercular bases. Wood soft, very porous with large pores and fine medullary rays.

31 POINCIANA, Linn.

Unarmed trees. Leaves bipinnate; stipules inconspicuous. Flowers in corymbose racemes, large; bracteoles O. Calyx deeply cleft with the disk a little above the base; the segments valvate, subequal. Petals orbicular, clawed; margin of blade fimbriate crisped. Stamens 10, free, declinate, exserted. Ovary subsessile; ovules numerous; style very long, filiform; stigma minute, capitate. Pod large, flat ligulate; seeds transverse, oblong, albuminous; cotyledons thick; radicle short, straight.

Flowers bright scarlet	...	...	...	... 1. P. regia.
Flowers yellow	...	...	...	... 2. P. elata.

1. P. regia, Bojer. Bot. Mag. t. 2884; Fl. Br. I. 2, 260; Dalz. & Gibs. Bomb. Fl. Suppl. 27. *Goolmohr Tree.* Cultivated in gardens throughout the presidency, very ornamental. A native of Madagascar. Fl. H. S. Fr. remains long on tree. Wood white, soft, open-grained.

2. P. elata, Linn.; DC. Prodr. 2, 484; Fl. Br. I. 2, 260; Bedd. Fl. Sylv. t. 178.; Brandis For. Fl. 157; Dalz. & Gibs. Bomb. Fl. Suppl. 28; Cooke Fl. Pres. Bomb. 1, 414; Brandis Ind. Trees, 249. *Vayni, sankasura,* Vern. A small tree with ash-coloured bark, very ornamental and handsome when in flower; said to be indigenous in the forests on the Western coast as far North as Guzerat. Brandis.

A small tree. Leaves abruptly-bipinnate, 4″-8″ long; main-rachis slender; pinnæ opposite, 4-8 pairs; leaflets 10-20 pairs, linear, ·3″ by ·12″, glabrous, caducous. Flowers in terminal, few-flowered corymbs; pedicels stout, finely pubescent. Calyx ·75″-1″ long, coriaceous, silky-pubescent outside; lobes linear-oblong, acute. Petals 4, white, 1 yellow; all turning orange when fading; the margins much curled. Stamens and style twice as long as the petals. Pod 6″-8″ by ·75″-1·25″, narrowed at both ends from the persistent calyx, veined, glabrous.

Spread all over the Barde Hills in Porebunder, Kathiawar, naturalized, doubtfully indigenous. Cultivated in gardens throughout the presidency. Fl. rainy season. Fr. cold season. Wood yellow, close and even-grained, soft.

32. PARKINSONIA, Linn.

Spinous trees. Leaves bipinnate; pinnæ with a flattened rachis; leaflets very small, often absent. Flowers yellow, in short axillary racemes; bracts small, caducous. Calyx deeply cleft with a sub-basal disk. Petals exserted, broad, with long claws. Stamens 10, free, villous at the base, included. Ovary shortly stalked; ovules numerous; style filiform; stigma terminal. Pod turgid, dry, moniliform.

P. aculeata, Linn. DC. Prodr. 2, 486; Fl. Br. I. 2, 260; Bedd. Fl. Sylv. 91; Brandis For. Fl. 158;

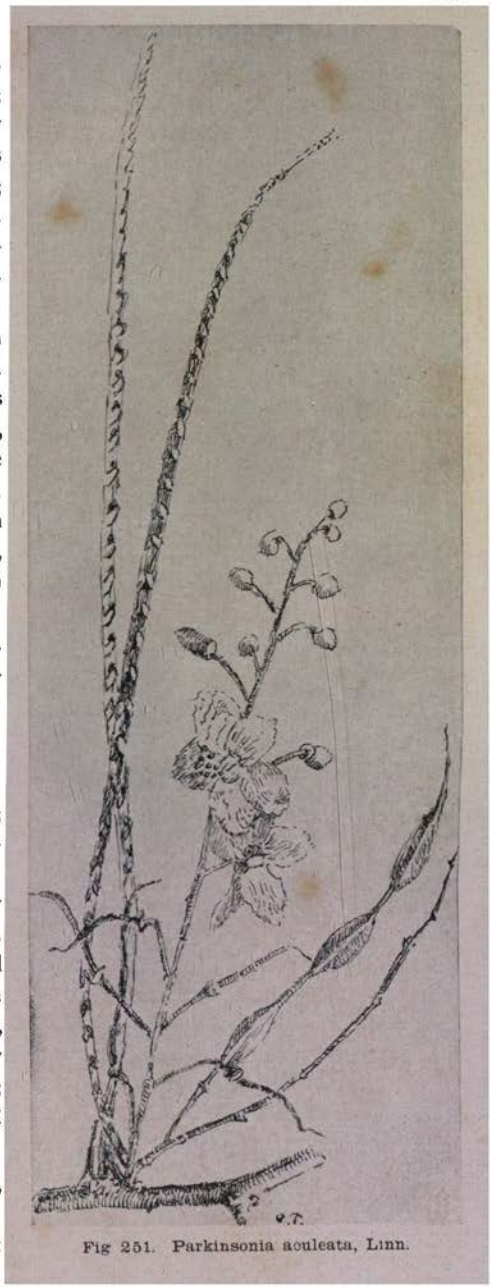


Fig 251. Parkinsonia aculeata, Linn.

Dalz. & Gibs. Bomb. Fl. Suppl. 28. *The Jerusalem Thorn ; Vilayati-kikar,* Sind.

A small glabrous, spinous tree. Leaves bipinnate ; rachis very short, thick, ending in a stout spine, often with a pair of stipular spines at its base ; pinnæ 1-3 pairs, 6″-12″ long with a flattened, striate, coriaceous rachis ; leaflets opposite or alternate, minute, sometimes absent, ovate, obtuse, inserted along the margins of the rachis ; petiolules distinct, very short. Flowers yellow, in axillary racemes shorter than the leaves ; pedicels ·3″-·6″ long, slender, thickened and articulate near the top. Calyx ·3″ long ; segments nearly equal, oblong, obtuse, distinct almost to the base. Petals yellow, equal, ·6″-·75″ long with an orbicular, veined limb and a short villous claw. Stamens free, flattened, villous at the base. Ovary silky-hairy ; ovules numerous. Pod linear, contracted between the seeds, 3″-4″ by ·25″-·4″, glabrous, 1-6-seeded.

Completely naturalized in all the dry regions of India, Deccan, Punjab etc. ; cultivated as a hedge plant or as a roadside tree throughout the presidency. A native of the West Indies. Fl. throughout the year. Wood whitish, close-grained ; used for fuel and charcoal ; makes good fences.

33. WAGATEA, DALZ.

A prickly climber with long, trailing branches. Leaves abruptly bipinnate. Flowers nearly sessile, in simple or panicled spikes, orange and red-coloured. Calyx cleft half-way down into 5, obtuse teeth, the disk high up in the tube. Corolla, little exserted. Stamens 10, free, slightly declinate ; filaments naked. Ovary sessile ; style slightly clubbed ; stigma oblique. Pod red-tomentose, ligulate, oblong, sub-torulose, indehiscent, few-seeded ; sutures thickened.

W. spicata, Dalz. in Kew Jour. 3, 90 ; Fl. Br. I. 2, 260 ; Dalz. & Gibs. Bomb. Fl. 80 ; Cooke Fl. Pres. Bomb. 1, 416 ; Brandis Ind. Trees, 249 ; *Cæsalpinia digyna,* Grah. Cat. 60. *Wagati, wakeri, kuldgajga,* M. ; *Hooliganji, vagati,* K.

A very robust, prickly climber. Leaves bipinnate, 9″-12″ long ; rachis puberulous, armed with numerous recurved prickles ; pinnæ 4-6 pairs, 3″-5″ long ; leaflets 5-7 pairs, 1·5″-1″ by ·75″-·5″, coriaceous, ovate-oblong, obtuse or subacute, rounded or slightly cordate at the base, glabrous, dark-green, shining above, pale and puberulous on the nervation beneath ; petiolules very short. Flowers nearly sessile, densely-arranged in long spikes along a furrowed, reddish-brown velvetty, thick, prickly rachis. Calyx ·5″ long, bright-scarlet ; tube campanulate, tomentose ; lobes subspathulate, as long as the tube. Petals ·5″ long, equal, inserted along with the stamens on the top of the disk lining the calyx-tube. Stamens 10, alternately long and short ; filaments flattened and densely hairy at the base. Ovary densely pubescent ; ovules 4-6. Pod 1·5″-3″ by ·5″, fleshy ; seeds 3-4, transverse, with a hard, bony testa.

Fig 252. Wagatea spicata, Dalz. (½ *size*).

Common throughout the presidency both in dry and moist monsoon-forests, apparently endemic in the Western peninsula. Fl. C. S. Fr. H. S. Stems up to 8″ in diameter at the base. Bark grey, corky, rough and finely furrowed, covered with scattered cones about 1″ in diameter and height, consisting of alternate layers of hard and soft periderm, crowned at the top with a straight or curved prickle. Wood light-reddish, smooth, hard. Pores small or moderate-sized, joined by irregular concentric, wavy bands of tissue. Medullary rays numerous, fine, white, uniform. Annual-rings indistinct. Weighs 52 lbs. to the cub. ft. The pods (*Tere pods*) contain a large proportion of tannic acid. Roots used in cases of pneumonia. Bark yields a dye material and is used as an application for skin diseases.

34. CASSIA, Linn.

Trees, shrubs or rarely herbs. Leaves abruptly pinnate; rachis often glandular. Flowers usually large and showy, often yellow, in axillary racemes or terminal panicles; bracts and bracteoles various. Calyx-tube very short or O; sepals imbricate. Petals 5, nearly equal, imbricate. Stamens 10, all perfect or 3-5 more or less abortive; anthers dehiscing at the apex by 2 pores or slits. Ovary sessile or stalked; style incurved; stigma terminal. Pod indehiscent or 2-valved, usually transversely-septate; Seeds transverse (rarely longitudinal), compressed, albuminous; cotyledons flat.

Pod large, terete, indehiscent; seeds compressed, parallel with the dissepiments.
Stamens all anther-bearing; 2-3 lowest with large anthers and long, curved filaments ... ... 1. C. Fistula.
Pod compressed; seeds flattened, parallel with the valves.
Perfect stamens 7; anthers usually subequal, the 3 posterior filaments without anthers (staminodes).
Leaves with interpetiolar glands. Stipules large, lunate, foliaceous ... ... 2. C. auriculata.
Leaves without interpetiolar glands.
Stipules minute, caducous ... ... 3. C. montana.
Stipules large, persistent, foliaceous ... 4. C. timoriensis.
Perfect stamens 10; anthers subequal ... 5. G. glauca.

1. C. Fistula, Linn.; DC. Prodr. 2, 490; Fl. Br. I. 2, 261; Bedd. Fl. Sylv. 91; Dalz. & Gibs. Bomb. Fl. 80; Brandis For. Fl. 164; Cooke Fl. Pres. Bomb. 1, 417; Brandis Ind. Trees, 253; Gamble Ind. Timb. 271; Trimen Fl. Ceyl. 2, 103. *The Indian Laburnum* or *Purging Cassia. Boya, bahawa*, M.; *Kakkai*, K.; *Chimkani*, Sind.; *Girmala*, Guz.

A moderate-sized, deciduous tree; branches slender, spreading, pubescent at the extremities. Leaves 12″-18″ long; leaflets 4-8 pairs, ovate or ovate-oblong, acute or shortly acuminate; base cuneate; 2″-5″ by 1·5″-3·75″, subcoriaceous, glabrous and bright-green above, pale and more or less silvery-pubescent, particularly on the nervation beneath; lateral-nerves numerous, branching; petiolules ·25″-·5″ long; stipules minute, pubescent. Flowers large, fragrant, bright-yellow, in lax, pendulous racemes, 12″-20″ long; pedicels 1·5″-2·5″ long, pubescent; bracts minute, caducous. Calyx ·4″ long, divided to the base; segments oblong, obtuse, puberulous. Corolla 1·5″ across; petals obovate, veined, shortly-clawed. Stamens all antheriferous; 3 lower largest with curved filaments and oblong anthers, dehiscing longitudinally; 4 with short filaments, the anthers dehiscing by basal-pores; remaining 3 short, the anthers without pollen. Pod cylindrical, 1′-2′ long and 1″ thick, pendulous, smooth, shining dark-brown, indehiscent; seeds numerous, horizontal, in black, sweet pulp and completely separated by thin, transverse dissepiments; seeds small, ovoid, slightly compressed, smooth, shining, yellowish-brown; cotyledons flat; albumen horny.

Very generally distributed throughout the mixed monsoon-forests of tropical India also found in the fresh water swamp-forests of Burmah, ascends to 4000′

in the outer Himalaya. In the Bombay presidency it occurs as a scattered tree throughout the Deccan and Konkan forests, ascends to 3700′ in the Khandesh Akrani; appears to thrive equally well on trap, granitic and sandstone soils. A moderate-sized, deciduous tree, seldom quite bare of leaves, very ornamental when in flower during April and May, consequently frequently planted along roadsides and in gardens. Bark greenish-grey, compact, about ·25″ thick, smooth when young, reddish-brown and rough in old trees. Sapwood

Fig 253. Cassia Fistula, Linn.

white, perishable; heartwood ranging in colour from light yellowish-red to reddish-brown, hard; strong and durable. Annual-rings distinct in the heartwood. Pores moderate-sized, enclosed in and joined by wavy disconnected or anastomosing bands of white, soft tissue. Medullary rays numerous, fine, slightly wavy, distinct and prominent on the dark tissue between the light-coloured concentric bands. Weighs 60 lbs. to the cub. ft. Timber hard and difficult to work, usually of small dimension, owing to the large sapwood, is somewhat brittle and liable to splinter; used for carts and agricultural implements. The pulp of

the pods is a well known and safe purgative, it is however eaten apparently with impunity by bears and monkeys. The bark is used in tanning and is in extensive demand for the Cawnpore tanneries. The wood is an excellent fuel and yields first class charcoal and the stem exudes a little used, soft gum. The flowers are employed in the religious ceremonies of the Hindoos. Like *Cassia auriculata*, the leaves are rejected by goats and cattle. The pulp of the pods is used to flavour native tobacco.

2. C. auriculata, Linn.; DC. Prodr. 2, 496; Fl. Br. I. 2, 263; Bedd. Fl. Sylv. 92; Dalz. & Gibs. Bomb. Fl. 81; Brandis For. Fl. 165; Cooke Fl. Pres. Bomb. 1, 421; Gamble Ind. Timb. 273. *The Tanner's Cassia; Turwad, tarvad, arsul,* Vern. *Tangadi-gidda,* K.

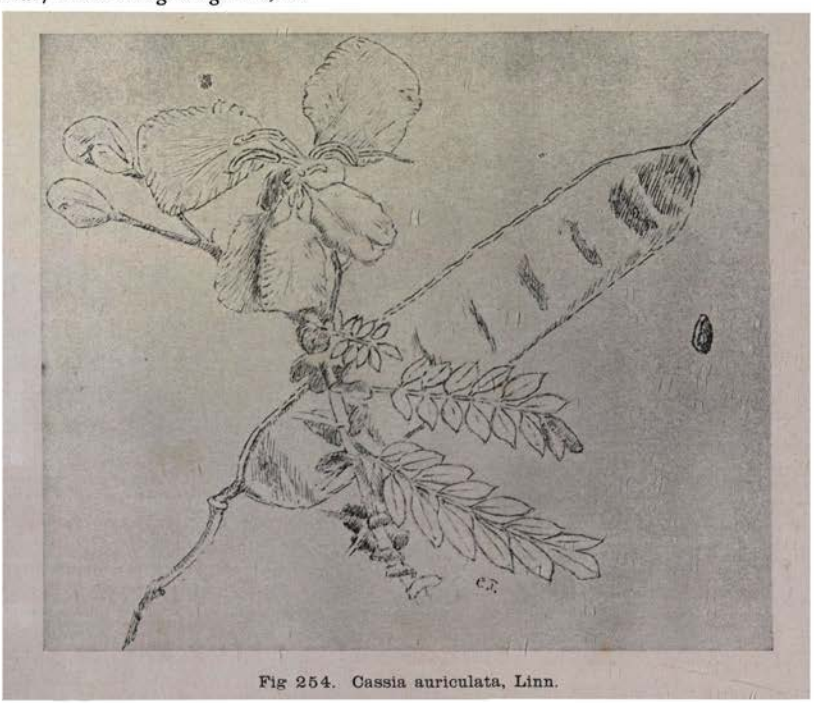


Fig 254. Cassia auriculata, Linn.

A large, pubescent, often gregarious, evergreen shrub. Leaves 3″-4″ long, closely arranged on the branchlets; rachis slender, densely pubescent, furrowed, with a linear gland between each pair of leaflets; stipules large, foliaceous, rounded, cordate, pubescent, persistent; leaflets 8-12 pairs, ovate, obtuse, mucronate, ·75″-1″ by ·3″-·5″, glabrous or downy; petiolules very short. Flowers large, 2″ across, yellow, crowded in the upper leaf-axils, forming terminal, corymbose

panicles; pedicels ·25″-1″ long; bracts ovate, acuminate, caducous. Calyx-lobes unequal, leathery, pubescent; the 2 outer much smaller than the other 3, concave. Petals with long claws and crisped on the margins. Stamens 10; 7 perfect with long, cylindrical, curved anthers; the 3 upper reduced to staminodes. Pod flat, ligulate, 3″-4·5″ by ·5″, thin, tipped with the remains of the style, pale-brown, undulately-crumpled; seeds in a single series, distinctly placed, each in a separate cavity.

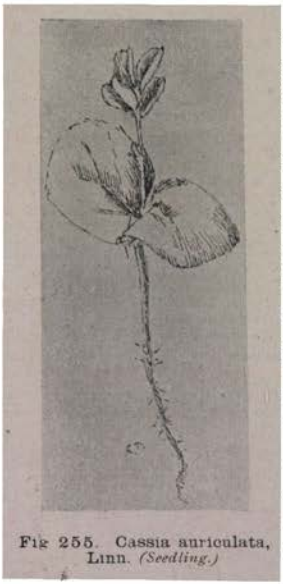


Fig 255. Cassia auriculata, Linn. *(Seedling.)*

An evergreen, xerophitic, often gregarious shrub, sometimes 8′-10′ high, growing on black cotton soil or on dry, stony ground throughout the savannah and thorn-forests of the Deccan and Guzerat, also in the Southern Mahratta country and the "Laterite" region along the sea-coast where it is associated with numerous spinous shrubs in the isolated thickets and clumps of vegetation of the open thorny bushwood. It owes its existence in many places to the fact that goats and cattle will not eat the leaves which possess strong, purgative qualities. *Tarwad* bushes are usually in flower throughout the year. Bark thin, cinnamon-brown, with numerous irregularly scattered, brownish coloured lenticels. Wood brown, hard. Pores small, distributed in irregular wavy, concentric bands of white tissue. Medullary rays numerous, fine, regular. A very important shrub, clothing as it does otherwise barren areas. The bark yields one of the most valuable tans in India, suitable especially for heavy hides where colour is not of great importance. The leaves are made into a kind of tea in Ceylon called *Matara* or *Ceylon tea* which resembles ordinary tea in appearance when properly prepared. The infusion is aromatic and slightly purgative. A considerable revenue is made from the sale of the bark in Southern India and in some of the Deccan districts. The shrub is ready for cutting when it is 5 years old and a rotation of 3 years is the most suitable for regular treatment of the crop.

3. C. montana, Heyne; DC. Prodr. 2, 499; Fl. Br. I. 2, 264; Dalz. & Gibs. Bomb. Fl. 265; Cooke Fl. Pres. Bomb. 1, 423; Brandis Ind. Trees, 254; Gamble Ind. Timb. 275.

A small tree or large shrub; branchlets angular, fulvous-pubescent. Leaves 4″-6″ long; rachis more or less fulvous-pubescent and without interpetiolar glands; stipules minute, caducous; leaflets 10-12 pairs, membranous, 1″-1·5″ by ·3″-·5″, ovate-oblong, obtuse or subemarginate with a long mucro, glabrous above, glaucous, sparsely hairy on the nerves beneath; petiolules ·1″ long, pubescent. Flowers

in large, corymbose racemes, forming a terminal panicle as long as the leaves; pedicels slender, 1″-2″ long, clothed with fulvous pubescence. Calyx divided to the base; sepals broad-ovate, concave, obtuse, glabrescent, with membranous margins. Corolla yellow; petals subequal, ·5″ long, oblong-obtuse, shortly clawed. Stamens 7, perfect, subequal, with large, oblong, yellow anthers; 3 upper stamens reduced to staminodes. Pod stalked, glabrous, 3″-5″ by ·5″-·6″, brown, shining, thin, hard and woody, ending in a hard, conical point; seeds 12-20.

Southern and Western India, South Deccan and the Carnatic. A rare species in the Bombay presidency, found in the monsoon-forests of the Belgaum ghâts. ("At Virdee and Chorla ghât," Dalz.). Fl. July-Aug. Fr. C. S.

4. C. timoriensis, DC. Prodr. 2, 499; Fl. Br. I. 2, 265; Bedd. Fl. Sylv. 92; Cooke Fl. Pres. Bomb. 1, 423; Gamble Ind. Timb. 274.

A large shrub or small, evergreen tree with a tall, slender trunk; branches grooved, pubescent. Leaves 7″-10″ long; rachis eglandular; stipules leafy from a broad base, fulvous-hairy, ending in a prolonged point, semi-persistent; leaflets 10-16-pairs, membranous, narrowly-oblong, obtuse, mucronate, 2″-1″ by ·5″-·3″, sparsely pubescent above, pale and more or less fulvous-pubescent beneath; petiolules ·1″ long. Flowers 1·25″ across, in corymbose, axillary or terminal panicles, shorter than the leaves; pedicels about 1″ long, fulvous-hairy. Calyx divided to the base; sepals broad, concave, obtuse, unequal, fulvous-pubescent, with membranous margins. Corolla bright-yellow, veined with orange, oblong, ·5″ long, with a short claw. Stamens 7 perfect, subequal, with long, cylindrical, curved anthers. Pod distinctly stalked, 5″-6″ by ·5″, thin, ligulate, almost black, very glossy, with sharp, transverse ridges, abruptly pointed at the ends; seeds 16-20, obovoid, cuneate, compressed, with a shallow pit on each face.

Found in Burmah and the islands of the Malay archipelago. The Phillipines, N. Australia and Ceylon in the low, moist country. In Peninsular India it is indigenous in the rain-forests of N. Kanara and along the ghâts, often in open situations from Goa southwards. Fl. Oct. Fr. ripe C. S. Wood dark-brown, nearly black. Gamble.

5. C. glauca, Lam. DC. Prodr. 2, 495; Fl. Br. I. 2, 265; Bedd. Fl. Sylv. 91; Dalz. & Gibs. Bomb. Fl. Suppl. 30; Cooke Fl. Pres. Bomb. 1, 425; Brandis Ind. Trees, 255. *Betta davare*, K.; *Motha-tarvad,* M.

A large shrub or small tree with spreading, grooved, more or less glabrous branches. Leaves petioled, 5″-9″ long; rachis adpressed, grey-pubescent with an erect, clavate gland between each of the 3 lower pairs of leaflets; stipules ·4″-·5″ long, linear, acute, falcate, subpersistent; leaflets broadly-ovate, obtuse, emarginate or subacute, 3″-1″ by 1·5″-·5″, (the terminal pair largest), subcoriaceous, green, glabrous above, glaucous and pubescent on the nerves beneath,

sometimes slightly unequal-sided at the base; petiolules ·12″ long, grey-pubescent. Flowers 1·5″ across, in axillary, corymbose racemes, shorter than the leaves; pedicels 1″-1·5″ long, grooved, pubescent; bracts ovate, reflexed, caducous. Calyx yellow, veined; sepals broad-ovate, glabrous; outer 2 smallest. Petals ·75″ long, broad-ovate, obtuse, with a short claw, veined and pubescent on the outside. Stamens 10, perfect, subequal. Pod stalked, 6″-8″ by ·5″-·75″, flat, thin, with raised lines between the seeds; seeds 20-30, smooth, compressed, narrow-oblong, dark-brown, shining, shallowly pitted on the faces.

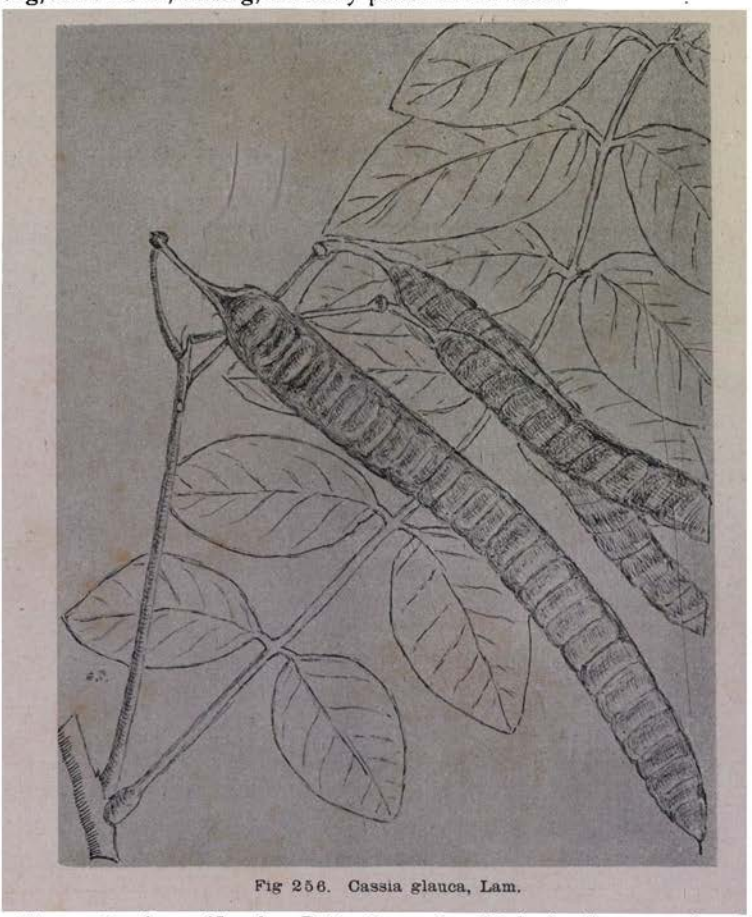


Fig 256. Cassia glauca, Lam.

Var. *suffruticosa,* Kœnig; F. Br. I. 2, 265; (Baker); *Senna speciosa,* Roxb. Fl. Ind. 2, 347. I doubtfully follow Baker in considering this a variety of *C. glauca,* Linn. It has 8-9 pairs of leaflets, obtuse; much smaller than in var.

typica, 1″-·4″ by· 4″-·25″; with scattered hairs beneath; petiolar-glands longer and flowers and pods much smaller, the latter with fewer seeds. This variety is found on sand-stone near Sutguttee in the Belgaum district.

Himalayas to Ceylon and Malacca. In the Deccan and North Kanara; common in the monsoon-forests of Dharwar district near the North Kanara border at Devikope; often planted. Fl. and Fr. Oct.-Nov.

C. marginata, Roxb.; *C. Roxburghii*, DC.; Wight Illust. t. 83. is cultivated in gardens at Poona, Belgaum and elsewhere in the Presidency. A small, handsome and ornamental tree with red flowers and cylindric pods like those of *C. Fistula*. Heartwood light-brown, very hard. Fl. throughout the R. S.

6. C. siamea, Lamk.; DC. Prodr. 2, 499; Fl. Br. I. 2, 264; Cooke Fl. Pres. Bomb. 1, 427; Brandis Ind. Trees, 254; Gamble Ind. Timb. 274; *C. florida*, Vahl. Bedd. Fl. Sylv. t. 179; *C. sumatrana*, W. & A. Dalz. & Gibs. Bomb. Fl. Suppl. 29. *Kassod*, M.

Fig 257. Cassia siamea, Lam.

Southern India, Burmah and Ceylon. A middle-sized tree with grey, nearly smooth bark, and 6-14 pairs of elliptic-oblong, mucronate leaflets. Flowers hand-

some, yellow, in large, pyramidal, terminal panicles. Pod flat, 4″-10″ long, minutely velvetty and thickened at the sutures. "Wood is streaked light and dark on a radial section, on a tangential section the dark patches appear as zigzag plates, a handsome wood for joinery work." Gamble. Yields a good fuel used for locomotives in Ceylon. Introduced, common throughout the presidency, largely planted along roadsides.

C. alata, Linn.; DC. Prodr. 2, 492; Fl. Br. I. 2, 264; Dalz. & Gibs. Bomb. Fl. Suppl. 29; Bedd. Fl. Sylv. 92. Introduced from the West Indies into the Deccan and Konkan.

C. gœnsis, Dalz.; Bedd. Fl. Sylv. 92. A large shrub; ("About Goa rare," Dalz.) is probably only *C. timoriensis,* DC. There are also several other species cultivated in gardens *C. lanceolata,* W. & A., Prodr. 288; *Senna officinalis,* Roxb. Fl. Ind. 2, 346. *C. javanica,* Spreng. Syst. 2, 333; *C. bicapsularis,* Linn.; W. & A. Prodr. 286; etc. vide Dalz. & Gibs. Bomb. Fl. Suppl. 29.

35. CYNOMETRA, LINN.

Unarmed trees or shrubs. Leaves odd-pinnate, leaflets few; stipules caducous. Flowers copious, minute, axillary. Calyx-tube short; disk sub-basal. Petals 5, equal, not exserted. Stamens 10; filaments free, erect. Ovary sessile, or stalked, 2-ovuled; style filiform; stigma capitate. Pod turgid, indehiscent, fleshy, rugose, 1-seeded; seeds exalbuminous; cotyledons thick, fleshy.

C. ramiflora, Linn.; DC. Prodr. 2, 509; Dalz. & Gibs. Bomb. Fl. 83; Bedd. Fl. Sylv. t. 315; Fl. Br. I. 2, 267; Cooke Fl. Pres. Bomb. 1, 427.

An evergreen, large or small tree. Leaves 3″-5″ long; stipules caducous; leaflets 2 pairs, subsessile, articulated on the short, wrinkled rachis, coriaceous, glabrous, shining, 1·5″-3·5″ by ·75″-1·5″, ovate, obtuse, oblique at the base. Flowers in axillary, few-flowered corymbose racemes; pedicels ·25″ long, slender; bracts broadly ovate, deciduous; bracteoles minute. Sepals ·12″ long; calyx-tube very short. Petals small, white or tinged with red, linear-lanceolate, ·15″ long. Pod turgid, wrinkled, irregularly ovoid, with a fleshy, pointed tip, subsessile, ·5″-1″ long.

Tidal forests of the Sunderbans to Chittagong and Tenasserim; S. and W. India (Konkan and N. Kanara), Burmah, the Andamans and Ceylon; often cultivated in gardens. Fl. H. S. Fr. ripe Aug.-Sept. Bark smooth, brownish-grey. Wood red, hard, heavy and close-grained. Numerous wavy bands of soft, light-coloured tissue alternate with bands of firmer tissue in which are visible the fine medullary rays. The characteristic fruit of this tree is sometimes carried down the Kalanadi during the rainy season and thrown up on the sea-shore near Karwar.

36. HARDWICKIA, Roxb.

Unarmed trees. Leaves abruptly pinnate ; leaflets few. Flowers small, abundant, in racemose panicles. Sepals 5, petaloid; disk subbasal. Petals 0. Stamens 10, included or exserted, alternately long and short. Ovary sessile, 2-ovuled; style filiform, winged or 0; stigma peltate or small. Pod dry, 1-seeded near top.

H. binata, Roxb. Fl. Ind. 2, 423; Fl. Br. I. 2, 270; Dalz. & Gibs. Bomb. Fl. 83; Bedd. Fl. Sylv. t. 26; Brandis For. Fl. 162; Cooke Fl. Pres. Bomb. 1, 428; Gamble Ind. Timb. 276; Brandis Ind. Trees, 250. *Anjan,* M.; *Kamra, karachi* K.

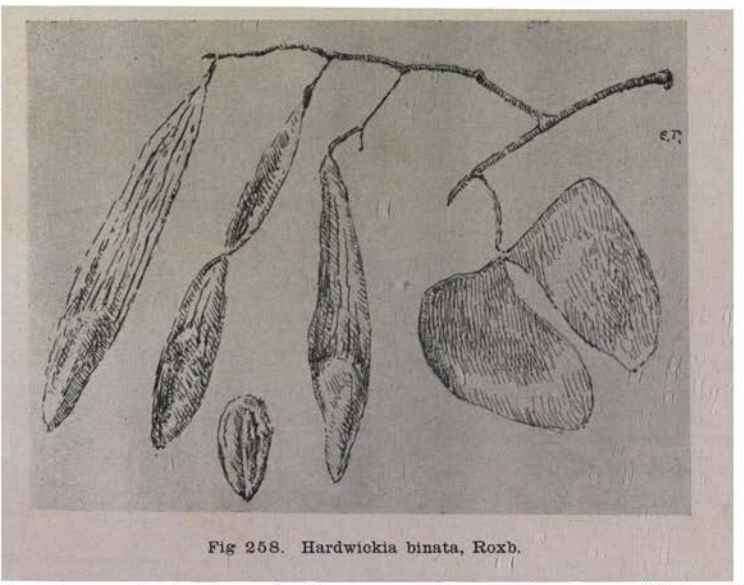


Fig 258. Hardwickia binata, Roxb.

A moderate-sized or large deciduous tree. Leaves alternate, 2-foliate; stipules small, cordate, caducous; leaflets sessile, entire, 1″-2·5″ by ·5″-1·2″, obliquely-ovate, obtuse, coriaceous, pale dull grey-green, glabrous, with 3-6, arched, basal-nerves and prominent, reticulate venation; petioles slender, ·5″-1″ long. Flowers in long, slender racemes, arranged in terminal panicles; bracts minute, caducous. Calyx ·2″ long; sepals distinct, membranous, often dotted, ovate or orbicular, petaloid, of a yellowish-green colour. Stamens 10; filaments slender, usually all with fertile anthers. Ovary oblong; stigma large, peltate. Pod strap-shaped, narrowed at both ends, 2″-3″ by ·6″, dehiscent at the apex, compressed, glabrous, veined; seed near the tip of the pod.

In the dry savannah-forests of Southern and Central India, extending northwards as far as the Banda district of the N. W. Provinces and in the Bombay Presidency; generally gregarious over widely separated areas of greater or smaller extent; common in Khandesh particularly in the Western Division, growing on the Deccan trap, also scattered throughout the dry thorn-forests of the Eastern parts of the Belgaum district, growing on sandstones of the Cuddapah series of rocks. There is a small, isolated patch of '*Anjan*' forest in the Ranebennur sub-division of the Dharwar district. Flowers very irregularly and sometimes at considerable intervals over its area of distribution. The flowers appear in the cold season and the fruit ripens in April and May. A very handsome tree with characteristic, grey, leathery foliage and drooping, slender branchlets. The stem is straight and regularly shaped but usually does not exceed 60′ in height; stems over 3″ in diameter are not uncommon in the W. Khandesh district. Bark ·5″ thick, rough and dark-grey coloured, peeling off in narrow flakes. Sapwood small, white; heart-wood extremely hard, dark-red, cross and close-grained. Pores moderate-sized, often subdivided and uniformly distributed, filled with resin. Medullary rays fine, numerous, undulating, crossed by scanty fine, concentric lines. One of the hardest and heaviest woods in India; weighs over 80 lbs. to the cub. ft.; used for building purposes, agricultural implements, naves of cart-wheels and generally for ornamental work. The bark yields a strong fibre and the leaves are in considerable request as cattle-fodder. Owing to sheep and cattle grazing, reproduction by seedlings over large areas in Khandesh and Nasik is much impeded. Multiplication of the species by root-suckers is however general and there appears little danger of the valuable *Anjan* disappearing from any of the areas of its distribution. During the frequent seasons of scarcity in the Deccan, permission to lop the *Anjan* in Government forests is given which accounts for the large proportion of mutilated stems met with in that part of the Bombay Presidency.

37. SARACA, LINN.

Unarmed trees. Leaves abruptly pinnate; leaflets few, coriaceous; stipules large, intrapetiolar, more or less united. Flowers in dense, corymbose panicles, often from nodes on the stems and branches, (cauliflory); bracts small, deciduous; bracteoles persistent, coloured, shorter than the calyx-tube. Calyx-tube long, cylindrical, with a disk at the summit; limb 4-cleft, Petals O. Stamens 3-8, free, exserted. Ovary stalked, with the stalk attached to and produced beyond the disk; ovules many; style long, filiform; stigma capitate. Pod dehiscent, oblong, woody, 2-valved; seeds exalbuminous.

S. indica, Linn. Mant. 98; Fl. Br. I. 2, 271; Bedd. Fl. Sylv. t. 57; Brandis For. Fl. 166; Cooke Fl. Pres. Bomb. 1, 429; Gamble Ind. Timb. 278; *Jonesia*

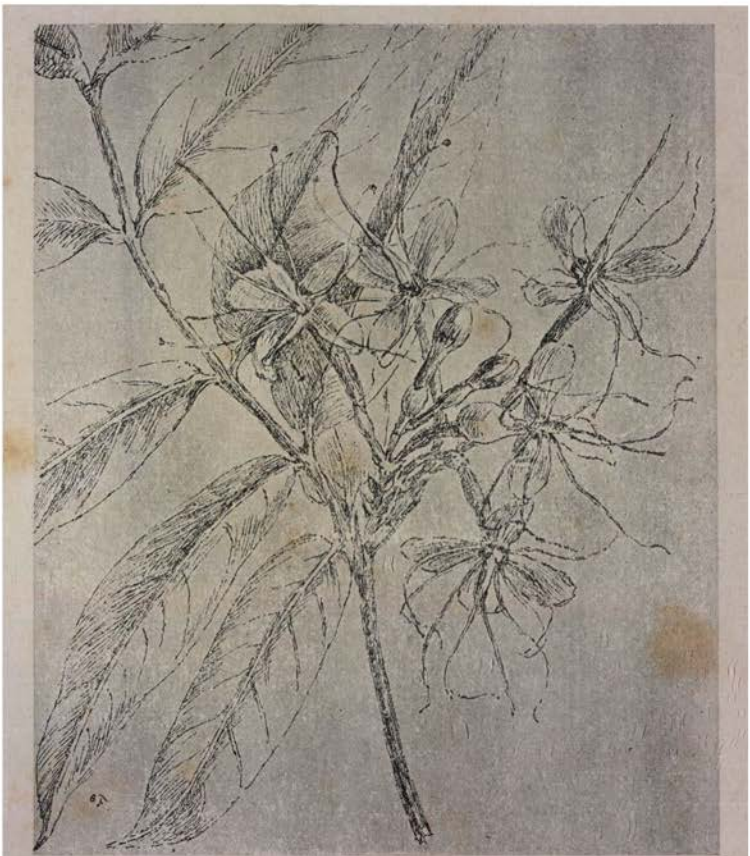


Fig 259. Saraca indica, Linn.

Asoca, Roxb. Fl. Ind. 2, 218; Dalz. & Gibs. Bomb! Fl. 82. *Ashok, jassundie,* Vern. *Ashoka, kusge, akshath,* K.

A small, evergreen tree with horizontally spreading, glabrous branches; stipules intrapetiolar, completely united, ·5″ long, ovate, acute, sheathing, scarious, brown, longitudinally-nerved, caducous. Leaves 6″-10″ long; rachis stout, puberulous when young, at length quite glabrous and corky at the base; leaflets 4-6 pairs, ovate-lanceolate, acute or shortly acuminate, 4″-9″ by 1·5″-2″, puberulous, thin, membranous, red-coloured when young, at length coriaceous and glabrous, cuneate and oblique at the base; lateral-nerves about 12 pairs; leaflets strongly reticulate beneath; petiolules ·25″ long, thick and wrinkled. Flowers 1″ long, yellow, turning to orange and finally to red, fragrant, numerous, in dense, short

corymbs; axillary, terminal or on the old wood; peduncles stout; pedicels ·5″ long, glabrous, red; bracts broad-ovate, acute, caducous and small; bracteoles 2, about ·2″ long, ovate, spathulate, amplexicaul, resembling unequal-sized, coloured calyx-lobes. Calyx-tube cylindric, solid at the base ·75″-1″ long; segments half as long as the tube, ovate, obtuse, veined. Stamens 7-8, much exserted, spreading; anthers purple. Ovary pubescent; style curved into a ring. Pods black, 4″-10″ by 2″, tapering at both ends, compressed and rigid, veined, glabrous; seeds 4-8. ovoid, slightly compressed.

From the Central and Eastern Himalayas to Ceylon and Malacca; Ceylon along streams in the low country, especially in the drier districts; in the evergreen rain-forests of the Konkan and N. Kanara, often planted in gardens. Fl. March-April. Fr. Aug.-Sept. A moderate-sized or small tree, usually growing in the deep shade of the rain-forest. Bark dark-coloured, rough with raised horizontal lines of lenticels; inner-bark thick, dark-red. Wood light reddish-brown, soft. Pores moderate-sized in radial and oblique lines. Medullary rays indistinct, crossed by fine, wavy, concentric, occasional belts of light reddish-brown tissue. Weighs 58 lbs. to the cub. ft. The *Ashok* presents like the *Mangoe* tree, *Amherstia nobilis, Polyalthia fragrans* and several other evergreen species the very remarkable phenomenon of hanging leaves, that is the leaves of young shoots after having attained their full size hang down limply; the leaflets are without chlorophyll, bright red-coloured and very thin and flaccid. At the end of each leaflet on either side of the apex is a large, conspicuous, glandular surface, probably excretory. The *Ashok* also produces its flowers on the old wood sometimes near the base of the stem (Cauliflory). It is one of the most sacred trees of the Hindus and Buddhists and its orange and red flowers are much used in temple ceremonies and decoration.

38. TAMARINDUS, Linn.

An unarmed tree. Leaves abruptly-pinnate; stipules minute, caducous Flowers racemed; bracts and bracteoles ovate-oblong, coloured, caducous. Calyx-tube turbinate; divisions 4, very imbricate, membranous. Petals with the 3 upper developed, the 2 lower reduced to scales. Stamens monadelphous, 3 perfect, united in a sheath; remainining stamens reduced to staminodes at top of the sheath. Ovary many-ovuled, stalked; stalk adnate to the calyx-tube; style filiform; stigma capitate. Pod linear-oblong, incurved, 3-10-seeded; mesocarp fleshy; seeds exalbuminous.

T. indica, Linn. DC. Prodr. 2, 488; Fl. Br. I. 2, 273; Dalz. & Gibs. Bomb. Fl. 82; Bedd. Fl. Sylv. t. 184; Brandis For. Fl. 163; Cooke Fl. Pres. Bomb. 1, 429; Gamble Ind. Timb. 278. *The Tamarind. Hunase,* K.; *Chinch,* M.; *Amli,* Vern.

A large, unarmed, evergreen tree, with glabrous, spreading branches. Leaves 2″-5″ long; leaflets 10-15 pairs, linear-oblong obtuse, glabrous, coriaceous, oblique at the base, ·3″-1·25″ by ·2″-·3″, close together on the rachis; venation reticulate. Flowers in 10-15-flowered, loose racemes at the end of short, lateral branchlets; pedicels slender, ·2″ long, articulate at the top near the calyx; bracts boat-shaped, ·25″ long, enclosing the buds, caducous. Calyx .5″ long; tube turbinate; lobes subequal, oblong, obtuse or acute. Petals ·4″ long, subequal, ovate-oblong, yellow with red stripes. Stamens 3; filaments connate for half their length and pubescent at the base; anthers oblong. Ovary stalked; ovules 8-12; style pubescent, equalling the stamens. Pods 3″-8″ by 1″, thick, fleshy and pendulous; seeds 3-12, smooth, brown, shining, compressed, with a shallow pit on each of the faces.

Fig 260. Tamarindus indica, Linn.

Probably indigenous in tropical Central Africa; througout India and the Tropics generally; self-sown near villages and waste-lands. In the Bombay Presidency it is the principal tree in many of the village topes and is also commonly planted as a roadside shade-tree. /Sometimes found in the forests but always either on abandoned village sites or from accidentally sown seeds.

A handsome, evergreen tree, often attaining to a great age. Stems over 10′ in diameter, found in Ceylon are mentioned in historical records as far back

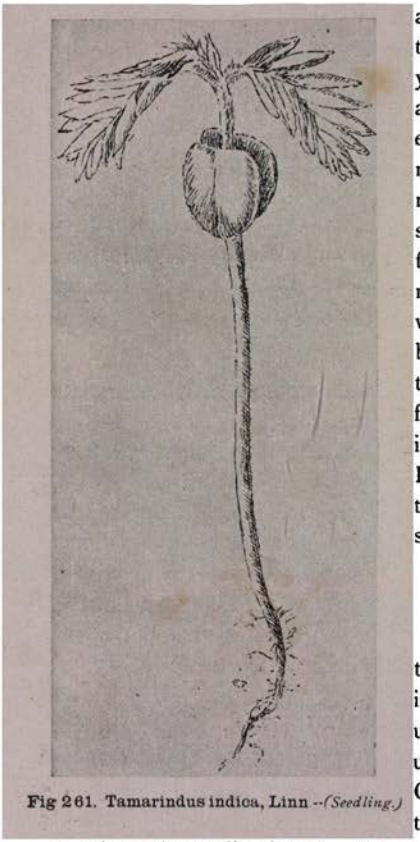


Fig 261. Tamarindus indica, Linn.—(Seedling.)

as 1659. Bark ·5″ thick, longitudinally and transversely fissured. Sapwood very large, yellowish-white, often reddish with streaks and patches; heartwood dark purplish-brown, extremely hard, heavy and durable. Pores moderate-sized, single or in groups, surrounded by rings of light-coloured tissue, sometimes confluent. Medullary rays very fine, numerous, distinct, equidistant. Weighs nearly 80 lbs. to the cub. ft. Used for cart wheels, rice-pounders, oil and sugar-mills, bedsteads etc. The heartwood is very difficult to work and is generally of small size. The fruit is used in medicine as a mild laxative, it is also made into preserves exported to Europe. The leaves are used in curries and the ground seeds mixed with gum furnish a strong cement.

39. BAUHINIA, Linn.

Unarmed trees or climbers with circinate tendrils. Leaves simple, cleft from the tip into two more or less connate leaflets; stipules usually small, caducous. Flowers showy, usually in terminal, paniculate-racemes. Calyx-tube short with the disk produced to the top; limb spathaceous or 2-5-cleft. Petals 5, subequal, usually clawed. Stamens 10 or reduced to 3 or 5 or all perfect. Ovary stalked, many-ovuled; style long or short; stigma small or large and peltate, subterminal or oblique. Pod linear, indehiscent or 2-valved; seeds albuminous.

Trees. Perfect stamens 10.

Calyx spathaceous or 5-cleft. Pod glabrous or tomentose.

Pod glabrous.

Calyx spathaceous. Pod turgid, not veined... 1. B. racemosa.

Calyx 5-cleft. Pod reticulately, veined ... 2. B. malabarica.

Pod red-tomentose, turgid ... ... 3. B. foveolata.

Twining shrubs with circinate watch-spring tendrils.

Leaflets distinct. Perfect stamens 10 ... ... 4. B. diphylla.

Leaflets connate. Perfect stamens 3 ... ... 5. B. Vahlii.

Trees. Perfect stamens 3-5.

Calyx 2-cleft to the base. Perfect stamens 3 ... 6. B. purpurea.

Calyx spathaceous. Perfect stamens 5 ... ... 7. B. variegata.

1. B. racemosa, Lam. Dict. 1, 390; Dalz. and Gibs. Bomb. Fl. 82; Bedd. Fl. Sylv. t. 182; Brandis For. Fl. 159; Cooke Fl. Pres. Bomb. 1, 431; Gamble Ind. Timb. 281. *Apta,* M.; *Banne,* K.; *Wanu rajah,* Vern.

Fig 262. Bauhinia racemosa, Lam.

A small, deciduous tree, pubescent or rusty-tomentose; branches pendulous. Leaves broader than long, ·5″-2″ by ·6″-2·5″, rigidly coriaceous, deeply cleft at the tip, slightly cordate at the base, glabrous above, pale and clothed with grey pubescence beneath; 4 basal-nerves in each of the leaf segments; petioles ·25″-·6″ long, pubescent. Flowers whitish-yellow, ·5″ long, in lax, terminal or leaf-opposed racemes, 3″-6″ long; pedicels shorter than the calyx; buds curved, rusty-tomentose; bracts linear, acute, tomentose, caducous. Calyx spathaceous, 5-toothed, at length reflexed. Petals linear-lanceolate, acute, ·4″ long, white or yellowish. Stamens 10, all fertile; filaments pilose at the base. Ovary pubescent; stigma sessile. Pod stalked, 6″-10″ by ·5″-1″, glabrous, turgid, slightly falcate, not venulose; seeds 12-20, oblong, compressed, black.

From the Punjab to Ceylon and Burmah in dry forests. Throughout the presidency in deciduous monsoon-forests. Old leaves shed in the cold season. A small, crooked tree with conspicuous, persistent pods. Fl. Mch.-June. Fr. Nov.-Mch. Bark ·25″ thick, dark-coloured, very rough, with deep, vertical fissures. Wood light-brown, hard, with an irregularly-shaped, darker and harder heartwood. Pores moderate-sized, often in short radial lines. Medullary rays numerous, very fine, uniform, equidistant, crossed by alternate, narrow, wavy bands of light and

dark-coloured tissue. Weighs about 40 lbs. to the cub. ft. Wood not used except for fuel. The inner-bark yields a strong fibre, sometimes made into ropes.

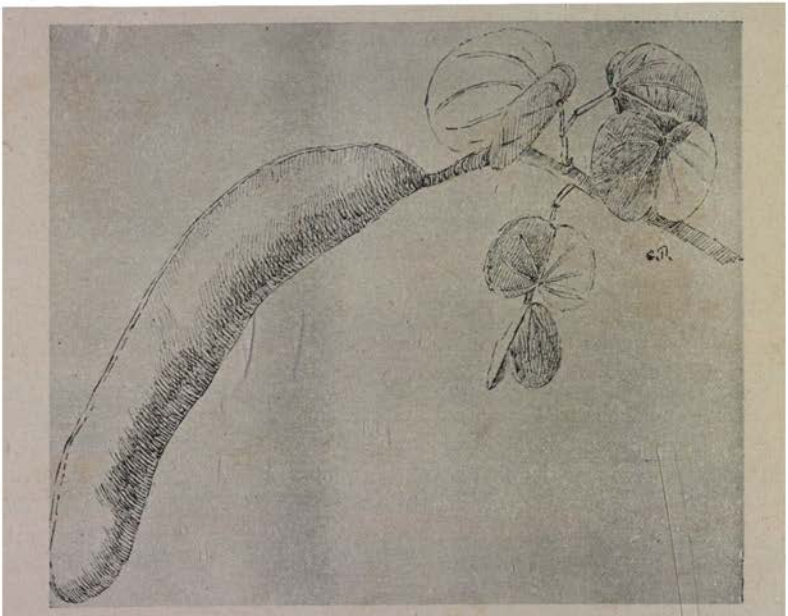


Fig 263. Bauhinia racemosa, Lam —*Fruit.*

2. B. malabarica, Roxb. Fl. Ind. 2, 321; Fl. Br. I. 2, 277; Dalz. & Gibs. Bomb. Fl. 82; Brandis For. Fl. 159; Bedd. Fl. Sylv. 92; Cooke Fl. Pres. Bomb. 1, 432; Gamble Ind. Timb. 282. *Amli,* Vern. *Shadloo,* K.

Usually a moderate-sized, sometimes a large, evergreen tree. Leaves broader than long, 4″-1·5″ by 4·5″-1·75″, deeply bifid at the apex into 2, obtuse lobes, broadly cordate at the base, dark-green, glabrous above, glaucous beneath (tomentose in var. *reniformis*), coriaceous; basal-nerves 7-11, prominent on the underside; venation close, reticulate, strong; petioles 1·5″-1″ long, channelled, thickened at the apex into a glandular, bilobed surface with a central slit on the upper side, articulate with the branchlet at the base. Flowers usually diœcious. Male flowers small, in densely-flowered, corymbose panicles or racemes about as long as the leaves; bracts minute, spreading, tomentose; buds ·4″ long, narrowly obovoid, densely tomentose; pedicels ascending, slender; lower 1·5″-2″ long. Female-flowers in short and few flowered racemes. Calyx densely brown-pubescent, ·4″ long; tube narrowly turbinate; limb broadly triangular, 5-toothed. Petals white, ovate-spathulate, slightly exserted. Stamens 10; filaments alter-

nately long and short, glabrous and flattened below. Ovary densely tomentose narrowed into the shortly exserted style, rudimentary and hairy in the male-flowers; stigma broad, peltate. Pod linear, rather turgid, 12″ by ·75″, narrowed into a 1″ stalk and rostrate at the apex, glabrous, usually straight, conspicuously veined with ascending lines; seeds 20-30, ovoid, shining dark-brown, ·2″ in diameter.

Western and Central Himalayas to Burmah and tropical India generally; throughout the moist monsoon-forests of the Konkan and North Kanara. Fl. Oct.-Nov. Fr. Apl.-May. Bark ·3″ thick, rough, dark-brown, scaly. Wood light reddish-brown, with a small dark-brown heartwood, moderately hard. Similar in structure to that of *B. racemosa*. Weighs about 45 lbs. to the cub. ft. Only use for fuel.

3. **B. foveolata,** Dalz. in Jour. Linn. Soc. 13, 188; Prain in Jour. As. Soc. Beng. 66, 496; Cooke Fl. Pres. Bomb. 1, 432; *B. Lawii,* Benth. ex Baker in Fl. Br. I. 2, 277. *Buswanpad,* K.; *Kanchan,* M.

A large deciduous tree. Leaves suborbicular, broader than long, 7″-4·5″ by 7·5″-5·5″, shortly divided at the apex into 2 subacute lobes, cordate at the base, coriaceous, glabrous and shining above, paler, more or less tomentose beneath, and covered with minute pits each of which contains a microscopic body attached to the pit wall by a short hair; basal-nerves 8 on each side of the midrib, very strong beneath, arching close to the leaf margin; finely reticulate between the prominent, nearly parallel intercostal veins; petioles stout, channelled, tomentose, 2″-2·5″ long, thickened at the apex and expanded into a glandular surface with a long longitudinal sinus on the upper side of the leaf. Flowers ·75″-1″ long, dicœcious, sweet-scented, in large, terminal, corymbose, panicled racèmes; buds obovoid, subsessile, densely covered with red tomentum; bracts and bracteoles minute, caducous. Calyx-tube short, turbinate ·2″ long; limb irregularly split into 5 linear-oblong, subacute lobes ·3″ long. Corolla white; petals exserted, clawed, spreading, about ·5″ long. Stamens 10, all fertile, alternately long and short, longest equalling the petals. Ovary columnar, rudimentary and without a stigma in the male flower, covered with shining hairs and crowned with a sessile, peltate stigma in the female. Pod turgid, twisted, 9″-12″ by ·75″-1″, red or reddish-brown, sometimes green tomentose, continuous and filled with white woolly-fibrous tissue between the seeds; seeds brown shining, size of a small bean.

Probably endemic in the moist, monsoon-forests of the Konkan and N. Kanara. A large tree with smooth, grey bark. Wood pinkish-white, soft, moderately heavy. Pores large, simple or divided. Medullary rays very fine and numerous crossed by wavy, nearly continuous, concentric bands broader than the pores. Weighs about 42 lbs. to the cub. ft. Not used in N. Kanara.

The alveolar depressions or pits which cover the under unwettable surface

of the leaf, between the basal-ribs may be in the nature of Haberlandt's "hydathodes," organs for the active exudation of water in hygrophilous species.

4. B. diphylla, Hamilt. in Symes It. Avens. t. 24; Fl. Br. I. 2, 278; Cooke Fl. Pres. Bomb. 1, 431; Gamble Ind. Timb. 281.

A large climbing shrub with glabrous, dark-brown, shining branches and circinate, flattened, "watch-spring", axile tendrils. Leaves of 2 distinct leaflets; petioles slender, obtusely angled, thickened at both ends, ·75″-1·5″ long, glabrous, furnished with a short, linear, weak spine at the apex, between the leaflets on the underside; leaflets sessile, 2″-2·5″ by 1·25″-1·5″, semiorbicular or subreniform, rounded at the top, thinly coriaceous, glabrous. Flowers large, in lax, terminal racemes; buds 2″-3″ long, fusiform, sometimes curved, glabrous, striate; peduncles thick, brown, glabrous, narrowed towards the apex. Calyx-tube ·75″-1″ long, narrowly turbinate; limb divided to the base into 5, linear-lanceolate, glabrous, spirally reflexed lobes, 1″-1·25″ long. Petals white, lanceolate, erect, as long as the calyx-lobes. Stamens 10, equal and all fertile; filaments glabrous. Pods stalked, 10″ long by 2·5″ broad, thin, brown, glabrous, with a long beak, thickened along the sutures; stalk 1·5″-2″ long; seeds numerous along the middle of the pod, ovoid, pale-brown.

In the dry forests of upper Burmah down to Prome. There are specimens of *B. diphylla,* labelled "Konkan"; Stocks in the Kew Herbarium, but it is nevertheless probably not indigenous in the Bombay presidency. Well grown plants are found in the Botanic garden at Hewra in the Poona district. The originals were put down by Dr. Gibson about 40 years ago. Fl. and Fr. R. S.

5. B. Vahlii, W. & A. Prodr. 297; Fl. Br. I. 2, 279; Dalz. & Gibs. Bomb. Fl. 83; Brandis For. Fl. 161; Cooke Fl. Pres. Bomb. 1, 433; Gamble Ind. Timb. 283. *Chambuli, chambil,* M.

A gigantic climber with opposite, circinate "watch-spring" tendrils; young parts densely rusty or fulvous-tomentose. Leaves suborbicular, 4″-10″ in diameter, cleft into 2, obtuse lobes at the apex for about ⅓ of their length with a linear prolongation of the central nerve between the lobes, deeply cordate at the base, subcoriaceous, downy or glabrescent above, persistently tomentose beneath; basal-nerves 11-13; tendrils axillary, often forked and flower-bearing; petioles 1·5″-5″ long, densely rufous-tomentose. Flowers in long-peduncled, terminal, sub-corymbose racemes; bracts linear, tomentose, ·2″ long; pedicels 1″-2″ long with 2, linear, subopposite bracteoles below the calyx-tube. Calyx densely villous; tube slender about ·25″ long; limb ·5″ long splitting into 2, broad, unequal lobes. Corolla creamy-white; petals obovate, 1″-1·5″ long, shortly clawed, adpressed-hairy along the middle on the outside; margins crisped. Fertile stamens 3, villous at the base; staminodes 2-7. Ovary shortly stalked, hairy; style long, slender;

stigma capitate, minute. Pod flat, woody, 9″-12″ by 2″, rusty-downy, shortly stalked, at length dehiscent and bursting with a loud report; seeds 6-12, 1·25″ by ·75″, ovoid, compressed, dark-brown, shining.

All along the Lower Himalayas from the Chenab eastwards, Northern and Central India, Assam, Behar and Tenasserim. In the moist monsoon-forests of the Konkan ghâts. A gigantic climber. Fl. Apl. Fr. ripe next Apl. Stems much fluted, 4′-5 in girth. Bark brown, horizontally waved. Wood porous, in broad, broken concentric layers, alternating with red juicy bark-like tissue. Pith cruciform on a cross-section. Yields a useful and strong fibre also a gum of little value. The leaves are used for plates, cups and umbrellas in the Nallamallais.

6. B. purpurea, Linn.; Roxb. Fl. Ind. 2, 320; Fl. Br. I. 2, 284; Bedd. Fl. Sylv. 92; Brandis For. Fl. 160; Dalz. & Gibs. Bomb. Fl. 30; Cooke Fl. Pres. Bomb. 1, 433; Gamble Ind. Timb. 283. *Dewa-kunchun, ragta-kanchan, atmatti,* Vern.; *kenchna, kanchana,* Bhil.

A middle-sized tree with stout, glabrescent branches. Leaves usually longer than broad, suborbicular, 4·5″-1·5″ by 3·5″-1·25,″ divided halfway down into 2 subacute lobes, shallowly cordate at the base, subcoriaceous, glabrous above, pale and grey-puberulous beneath; basal-nerves 9-11; middle nerve prolonged into a slender mucro; petioles 1″-1·5″ long, slender, glabrous, thickened at the base and apex; stipules ·1″ long, oblong, acute, pubescent, caducous. Flowers sweet-scented, deep pink, sometimes white, in terminal or axillary, short-peduncled, few-flowered corymbs; bracts minute, triangular, acute, pubescent; pedicels short, lower ·25″-·5″ long, 2-bracteolate below the middle; buds fusiform, grey-pubescent. Calyx-tube ·25″-·5″; limb ·75″-1″ long, splitting into 2 coriaceous valves, 5-toothed at the top. Petals 1·5″ long, by ·5″ broad, oblanceolate, with a long claw. Fertile stamens 3-4; filaments as long as the petals. Ovary long-stalked, grey-downy; ovules 16-20; style ·4″ long; stigma large, oblique. Pod 6″-12″ by ·75″-1″, flat, glabrous, subwoody, tardily dehiscent; seeds 12-16, compressed, oblong, ·6″ by ·5″, brown.

Sub-Himalayan tract from the Ravi eastwards, ascending to 5000′, Bengal, Burmah, Central and Southern India. An ornamental tree, cultivated throughout the presidency on account of its handsome flowers; also probably wild in the dry forests of the Deccan and Konkan, ascends to 3500′ in the Khandesh Akrani. Fl. Sept.-Nov. Fr. Jan.-April. Wood light-brown, hard, with an irregularly-shaped, harder and darker-coloured heartwood; used for agricultural implements and construction purposes when of sufficient size. The bark contains tannin.

7. B. variegata, Linn., DC. Prodr. 2, 514; Bedd. Fl. Sylv. 92; Brandis For. Fl. 160; Fl. Br. I. 2, 284; Dalz. & Gibs. Bomb. Fl. Suppl. 30. *Kanaraj, kovidara, kanchan,* Vern.

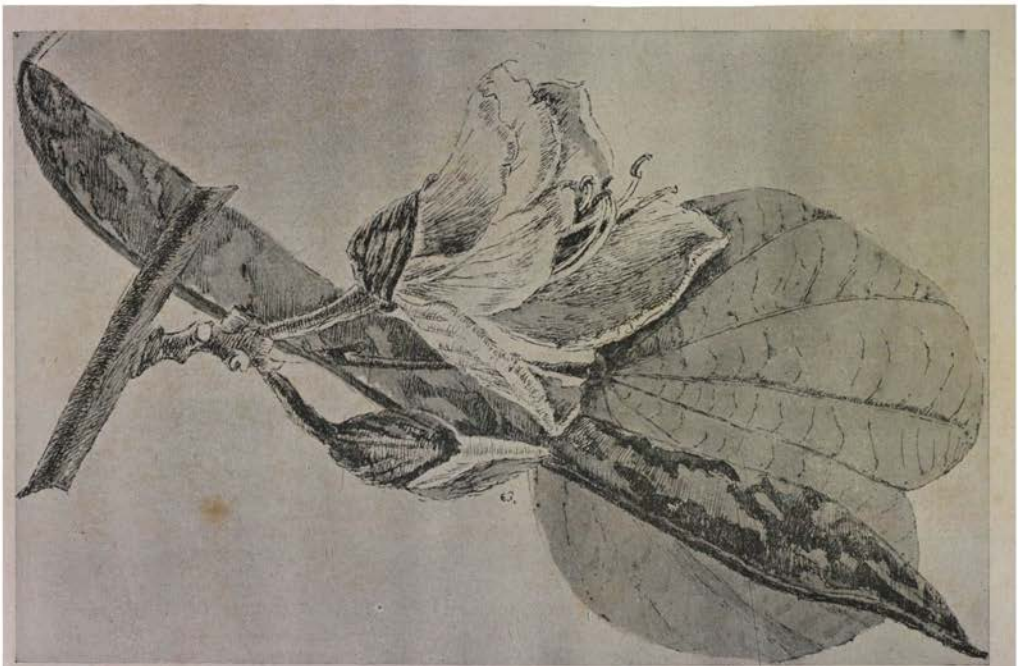


Fig 264. Bauhinia variegata, Linn.

Sub-Himalayan tract from the Indus eastwards and throughout the forests of Central and Southern India and Burmah, is probably not indigenous in Bombay; cultivated throughout the presidency, often as a roadside tree. Fl. Feb.-April. Fr. Nov. Wood grey, moderately-hard, with an irregular dark heartwood.

40. XYLIA, BENTH.

A large, deciduous unarmed tree. Leaves bipinnate; pinnæ 1 pair. Flowers sweet-scented, in globose, tomentose heads. Calyx tubular, 5-cleft. Petals linear, valvate. Stamens 10, free, exserted; anthers with deciduous, stipitate glands. Ovary sessile; ovules numerous; style filiform; stigma minute, terminal. Pod large, woody, falcate, dehiscent, septate between the compressed seeds; seeds with a fleshy funicle.

X. dolabriformis, Benth. in Hook. Jour. Bot. IV, 417; Fl. Br. I. 2, 286; Brandis For. Fl. 171; Bedd. Fl. Sylv. t. 186; Dalz. & Gibs. Bomb. Fl. 85; Cooke Fl. Pres. Bomb. 1, 436; Gamble Ind. Timb. 285. *The Iron Wood* of Pegu and Arracan. *Pynkado,* Burm.; *Jamba, yerul, suria,* M.; *Jambe, tiruwa,* K.

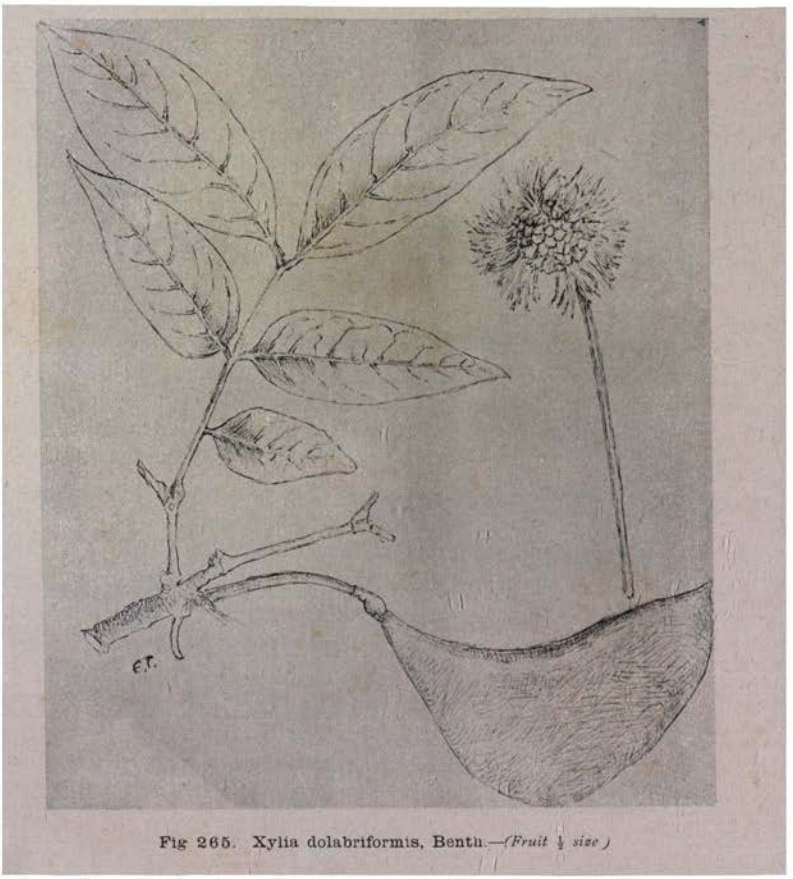


Fig 265. Xylia dolabriformis, Benth.—*(Fruit ½ size.)*

A medium-sized or large tree; young shoots pubescent. Leaves with one pair of pinnæ at the end of a common petiole 1″-2·5″ long with a gland between the pinnæ at the apex; leaflets 2-4 pairs diminishing in size from the top and with a single unopposed leaflet at the base of the pinnæ next to the petiole; terminal-leaflet 3″-6″ by 1·25″-2·5″, the lowest leaflet half as long, all ovate or ovate-oblong bluntly-acuminate, somewhat oblique, at the base, subcoriaceous, pubescent when young, soon glabrous; petiolules ·1″ long. Flowers pale-yellow, sweetly-scented, in long-pedunculate, globose heads, ·5″-·75″ in diameter, pedun-

cles 3″-4″ long, pubescent, slender, much thickened in fruit, on short, puberulous branchlets, appearing with the young leaves in the axils of the fallen leaves. Calyx tubular, ·2″ long, pubescent, with 5, valvate teeth. Corolla ·25″ long, yellowish; petals lanceolate, valvate, cohering at the base. Pods 4″-6″ long, flat, woody, falcate-oblong, cuneate at the base, light-brown, glabrous, elastically dehiscent; seeds 6-10, ovoid, compressed, with a brown, shining testa.

Central Provinces, Southern India, Burmah. Throughout the deciduous monsoon-forests of N. Kanara, S. Mahratta country and Konkan as far north as Bombay. In this presidency *Jamba* grows on schistose, gneissic and laterite soils, sometimes forming pure forests on old kumri lands. In many of the N. Kanara and Belgaum forests it constitutes a large proportion of the growing stock and in the latter district much of the firewood supplied to the S. M. Railway company is from this source. *Jamba* is absent from the Deccan-trap districts. Usually of small or medium-size with large-branches and defective, unsound stems, the result of forest fires. The tree is never quite bare of leaves in the moister parts of its habitat in Belgaum and N. Kanara. Bark smooth, scaling off in great, thick, irregular patches. Periderm thin, with a well developed layer of green-cells; inner-bark thick, white or reddish. Sapwood of mature trees about ·75″ thick; heartwood reddish-brown, hard. Annual-rings visible, but indistinct. Pores small and moderate-sized, filled with resin, often subdivided, enclosed in irregular patches of white tissue, often joined in short, zig-zag lines. Medullary rays very fine, uniform, distinct in the tissue. Weighs 55 to 75 lbs. ıto the cub. ft. Owing to the splitting of the wood whilst seasoning and to unsound stems there is great waste in converting the timber into railway-sleepers. In fact *Jamba* has been practically abandoned for these reasons as a sleeper-wood. In Kanara it is in demand for house-posts and various construction purposes, although very durable and resisting the attack of white ants it is heavy and difficult to work; is well suited apparently for street paving-blocks and there is probably a future before N. Kanara *Jamba* for this purpose. It is readily reproduced from seed and the seedlings are capable of standing dense shade, *Jamba* also coppices readily. Fl. Mch.-April. Fr. C. S.

41. ENTADA, Linn.

Lofty woody-climbers with tendrils. Leaves bipinnate; stipules small, setaceous. Flowers minute, yellow, in long, slender spikes; bracts minute. Calyx minute, campanulate, 5-toothed. Corolla oblong in bud; lobes 5, narrow, falcate. Stamens 10, free, exserted; anthers glandular. Ovary sub-sessile; ovules many; style filiform; stigma concave, terminal. Pod very large, constricted between the seeds into discoid joints; seeds flat, ovate, brown, shining.

E. scandens, Benth. in Hook. Jour. Bot. IV, 332; Fl. Br. I. 2, 287; Brandis For. Fl. 167; Cooke Fl. Pres. Bomb. 1, 437; Gamble Ind. Timb. 287; *E. pusætha,* DC.; Dalz. & Gibs. Bomb. Fl. 83. *Dodda-ganpi,* K.; *Gardul,* Vern.; *Garambi, garbe,* M.; *Gaer,* Kon.

An immense climber with twisted, angled stems. Leaves bipinnate; main rachis glabrous, grooved, furnished at the apex with a long woody, bifid tendril; pinnæ opposite, 2-3 pairs; leaflets 3-4 pairs, 1·5″-3″ by ·75″-1·25″, ovate-oblong, obtuse, often emarginate, coriaceous, dark-green, glabrous, shining; lateral-nerves numerous, parallel, looping well within the margin, slender; petioles ·1″ long. Flowers polygamous, pale-yellow, crowded in long-peduncled, panicled or simple spikes 6″-8″ long, from the axils of the upper leaves or from nodes on the old leafless branches. Calyx minute, shortly 5-toothed, ·05″ long. Corolla twice as long as the calyx; petals 5. Pods very large, 2′-4′ by 3″-4″, woody, consisting of 6-15, one-seeded, discoid or square, flat-joints, separating from the thickened sutures; seeds obovoid-oblong or orbicular-oblong, 1·5″-2·5″ in diameter, brown, shining with a very hard testa.

Central and Eastern Himalayas ascending to 4000′ in Sikkim; W. peninsula, Burma and Ceylon. Throughout the monsoon-forests of the North Kanara and Konkan ghàts, often along river banks. Fl. Mch.-May. Fr. Dec.-Jan. The great seeds contain an oil used as an emetic. They are often hollowed out and made into small boxes, used for various purposes. The cotyledons after being steeped in water for some time are eaten.

42. ADENANTHERA, Linn.

Trees. Leaves abruptly bipinnate with numerous small leaflets. Flowers minute, in slender, elongated, axillary or paniculate racemes. Calyx campanulate, equally-toothed. Petals free or connate at the base. Stamens 10, free; anther-cells with a deciduous gland at top. Ovary sessile; style filiform; stigma minute, terminal. Pod linear, 2-valved, seeds with a red or bicoloured testa.

A. pavonina, Linn.; DC. Prodr. 2, 446; Fl. Br. I. 2, 287; Bedd. Fl. Sylv. t. 46; Brandis For. Fl. 168; Cooke Fl. Pres. Bomb. 1, 438; Gamble Ind. Timb. 287. *Red Wood. Munjuti,* K.; *Val, thorla-gunj,* M.; *Badi-gumchi,* Guz.

A large deciduous, usually unarmed tree. Leaves bipinnate, 8″-12″ long; petioles 2″-4″ long; pinnæ opposite, 4-6 pairs; leaflets 12-20, evenly alternate, elliptic-oblong, obtuse, 1″-1·5″ by ·3″-·75″, dark-green, glabrous above, glaucous beneath, unequal-sided and acute at the base; nervation indistinct; petiolules ·15″ long. Flowers yellow, fragrant, in short, peduncled racemes, 2″-6″ long, axillary or panicled at the ends of the branches; pedicels slender, ·15″ long. Calyx small, campanulate, shortly 5-toothed. Corolla pale-yellow; petals long-

exserted, ·1″ long, united at the base, glabrous, linear-lanceolate, acute, valvate. Stamens free, hardly exserted. Pod 4″-9″ long, linear, shining, about ·3″ in diameter.

Fig 266. Adenanthera pavonina, Linn.

Bengal, southern India and Burmah. In the moist rain-forests of the Konkan and North Kanara, nowhere abundant. Fl. Mch.-May. Fr. Aug.-Oct. Wood with a hard, red, durable, close-grained, strong heartwood; used for house building and cabinet-making. The scarlet seeds are used for jeweller's weights and strung into necklaces.

43. PROSOPIS, Linn.

Prickly shrubs or trees. Leaves bipinnate; pinnæ usually 2 pairs; stipules small or O. Flowers in slender, panicled spikes, small, white or yellow, in the axils of ovate, membranous bracts. Calyx campanulate with 5, short teeth. Corolla with 5, ligulate petals, free or connate below. Stamens 10, free; anthers tipped

with a gland. Ovary stalked; ovules numerous; style filiform; stigma minute. Pod coriaceous, indehiscent, linear, pendulous; mesocarp spongy, septate between the seeds.

P. spicigera, Linn.; DC. Prodr. 2, 446; Fl Br. I. 2, 288; Bedd. Fl. Sylv. t. 56; Brandis For. Fl. 169; Dalz. & Gibs. Bomb. Fl. 84; Cooke Fl. Pres. Bomb. 1, 439; Gamble Ind. Timb. 288. *Sumri, hamra,* Guz.; *Shema, saunder, savandal,* Deccan.; *Kandi,* Sind.

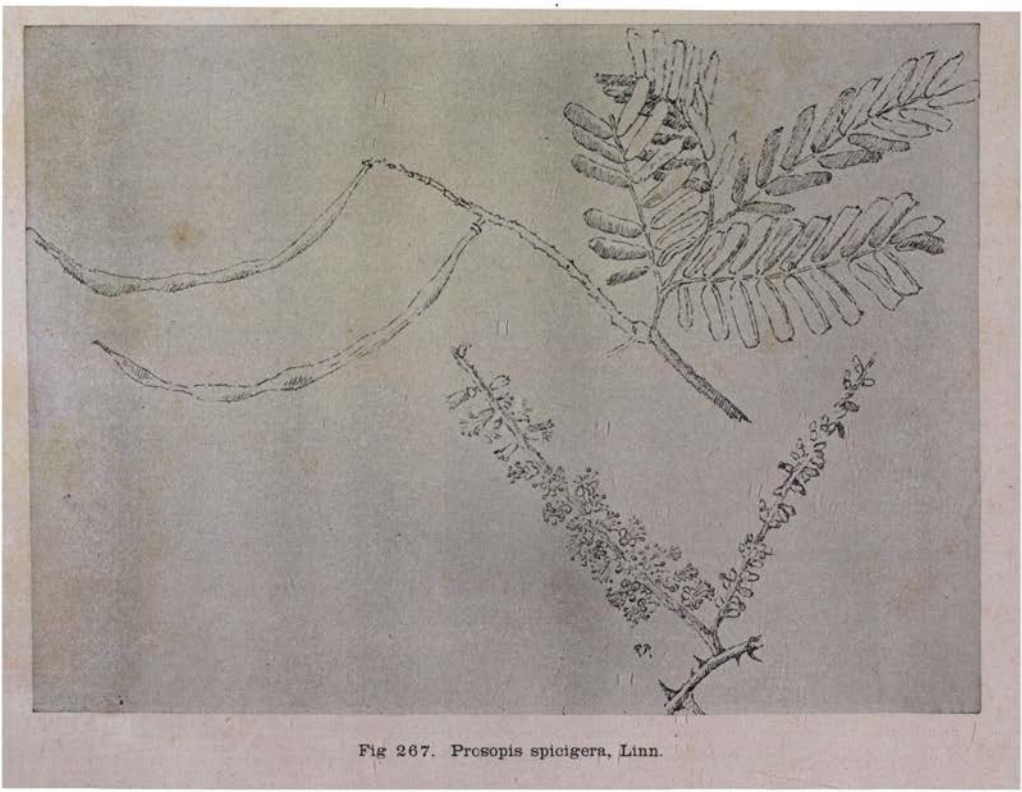


Fig 267. Prosopis spicigera, Linn.

A middle-sized, glabrous, deciduous, thorny tree; branches slender, armed with short, broad-based, conical prickles. Leaves bipinnate; pinnæ 1-2 pairs, opposite, 1″-3″ long; leaflets 7-10 pairs, ·4″-·2″ by ·15″-·05″, subsessile, oblong, unequal-sided, apiculate, base rounded, oblique, coriaceous, grey, glabrous, 3-nerved and reticulately-veined. Flowers very shortly pedicelled, on slender spikes, arranged in short, axillary panicles. Calyx minute, membranous, cup-shaped, broadly 5-triangular-toothed. Corolla yellow, ·12″ long. Pods coria-

ceous, indehiscent, 4″-8″ long, slender, cylindric, filled with a dry farinaceous, edible pulp; seeds 10-15, oblong, dull-brown.

Fig 268. Prosopis spicigera, Linn.—*(Seedling.)*

Wild in the dry regions of the Punjab, Sind and the Western peninsula. In the open thorn-forests of the Deccan and Guzerat and in Sind near the Indus river. Fl. Feb.-Apl. Fr. May-Aug. A moderate-sized, thorny tree with an exceedingly long tap root, which enables it to exist in the hottest and driest climates. Generally found scattered throughout the area of distribution. In Sind however it is gregarious and forms pure *Prosopis* forest near the Indus river above the level of inundation. Bark grey, rough, with deep fissures and horizontal cracks. Sapwood large; heartwood purplish-brown, very hard and tough but not durable; liable to dry-rot and is readily eaten by insects. Pores small to moderate-sized, included in narrow, concentric bands of soft, resinous tissue. Medullary rays short, numerous, fine, wavy; weighs 59 lbs. to the cub. ft. One of the sacred trees of the Hindus. Pods used as fodder for domestic animals, they also contain a pleasantly flavoured, farinaceous pulp, largely consumed as food in the Punjab, Guzerat and the Deccan. The wood yields a valuable fuel with great heating power, the principal fuel of the Punjab.

P. Stephaniana, Kunth, Brandis Ind. Trees, 269; Cooke, Fl. Pres. Bomb. 1, 439; Fl. Br. I. 2, 288; reported to have been found in Guzerat at Gogo by Mr. M. Woodrow, is indigenous in the Punjab, Afghanistan and Caucasus; it differs from *P. spicigera,* in having 3-5 pairs of pinnæ, long axillary spikes and a short, oblong, obtuse pod.

44. DICHROSTACHYS, DC.

A spinous shrub or small tree. Leaves bipinnate with closely set pinnæ and leaflets. Flowers minute, in axillary, peduncled spikes, polygamous, scented. Calyx minute, campanulate, 5-toothed. Corolla oblong with 5, strap-shaped, petals. Stamens 10, free, exserted; anthers tipped with a globose, stipitate, brown, wavy gland. Ovary sessile, many-ovuled; style filiform; stigma capitate. Pod linear, twisted, indehiscent or irregularly opening; seeds obovoid, compressed.

D. cinerea, W. & A. Prodr. 271; Fl. Br. I. 2, 288; Bedd. Fl. Sylv. t. 185; Brandis For. Fl. 171; Dalz. & Gibs. Bomb. Fl. 84; Cooke Fl. Pres. Bomb. 1, 440; Gamble Ind. Timb. 288. *Vurtuli,* Vern.; *Sigamkati,* M.

A much-branched shrub or small tree; spines axillary, strong, straight, sharp, often bearing leaves. Leaves bipinnate, 1·25″-2·5″ long; stipules

subulate from a narrow base; pinnæ 4-10 pairs with stipitate glands between each along the hairy rachis; leaflets 12-15 pairs, minute, puberulous, sessile, ·1″ long, linear-oblique, closely set, acute at the apex. Flowers crowded in short, dense, axillary spikes, the upper flowers of each spike bisexual, yellow; the lower sterile, white or purple with long, filiform staminodes. Calyx minute, membranous. Corolla 3 times as long as the calyx, ·1″ long. Pods 2″-3″ by ·25″-·4″, dark-brown, irregularly twisted, 6-10-seeded; seeds obovoid, compressed.

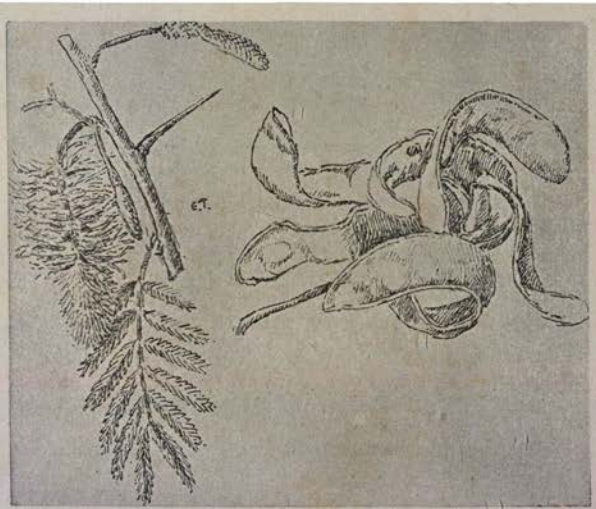


Fig 269. Dichrostachys cinerea, W. & A.

Common on the dry stony hills of Deccan, cultivated in North Kanara and the Konkan, North-West Provinces, W. Peninsula, S. and C. India and Ceylon. Fl. and Fr. H. and R. S. A small tree with twisted, often gnarled stems. Bark dark-brown, thin, peeling off in thin flakes, with deep, longitudinal cracks. Heartwood red, very hard and heavy. Pores moderate-sized, enclosed in rings of soft tissue. Medullary rays short, fine, moderately broad, equidistant. Weighs about 70 lbs. to the cub. ft. An excellent fuel, and makes good walking sticks.

45. LEUCÆNA, Benth.

Trees. Leaves bipinnate; stipules setaceous or small. Flowers 5-merous, sessile, in dense, globose heads; bracts usually 2. Calyx cylindrical, campanulate, shortly-toothed. Petals valvate, free; stamens 10, free, much exserted; anthers not gland-crested. Ovary stalked, many-ovuled; style filiform; stigma minute. Pod stalked, flat, strap-shaped, continuous within, dehiscent, many seeded.

1. **L. glauca,** Benth. in Hook. Jour. Bot. IV, 416; Fl. Br. I. 2, 290; Brandis For. Fl. 172; Cooke Fl. Pres. Bomb. 1, 440; Gamble Ind. Timb. 289.

A large shrub or small, unarmed tree. Leaves bipinnate, 3″-7″ long; stipules setaceous, small; pinnæ 4-8 pairs, 2″-3·5″ long, each with a pubescent rachis ending in a weak spine; petioles 1″-2″ long; leaflets 20-30, sessile, ·4″ by ·12″, linear-acute, unequal-sided, glabrous, caducous. Flowers in dense, globose heads, ·5″-·75″ in diameter, often in pairs; peduncles 1″-1·5″ long, slender, pubescent, thickened in fruit. Calyx ·1″ long, tubular-campanulate. Corolla ·4″ long. Petals white, thickened at the tips, spathulate. Pod straight, flat, 5″-6″ by ·6″, triangular-acute at the apex, narrowed into a stalk ·5″ long; seeds 15-20, their places marked by parallel somewhat oblique ridges along the centre of the pod which is early dehiscent.

A tropical American species; naturalised and commonly cultivated, in gardens throughout the presidency from the coast inland. Fl. June-Oct. Fr. remains long on the tree.

46. MIMOSA, LINN.

Shrubs or herbs, prickly or not. Leaves in the indigenous species bipinnate; leaflets small, often sensitive. Flowers polygamous, often tetramerous, minute, in globose, sometimes pink heads or cylindrical spikes. Calyx minute, campanulate, shortly toothed. Petals connate towards the base. Stamens twice the number of petals, exserted, free; anthers not gland-crested. Ovary stalked, many-ovuled; style filiform; stigma minute, terminal. Pod oblong or linear; valves membranous or coriaceous, made up of 1-seeded joints that separate when mature from the sutures; seeds ovoid, flat.

Pinnæ 1-2 pairs.
  Pod small; sutures prickly ... ... 1. M. pudica.
Pinnæ more than 2 pairs.
  Pod large; sutures without prickles .... 2. M. rubicaulis.
  Pod large; sutures armed with large, hooked prickles ... ... 3. M. hamata.

M. pudica, Linn.; DC. Prodr. 2, 426; Fl. Br. I. 2, 291; Dalz. & Gibs. Bomb. Fl. Suppl. 25; Cooke Fl. Pres. Bomb. 1, 441; Gamble Ind. Timb. 290. *Lajalu,* M. *Hadergitte,* K. *The Sensitive Plant.*

A diffuse, low, spreading, gregarious shrub; stems and branches densely clothed with deflexed, curved prickles and glandular hairs. Leaves very sensitive; rachis 1″ long, slender, grooved and covered with ascending, curved prickles; stipules linear-lanceolate, ·3″ long, bristly on the margins. Pinnæ 1-2 pairs, 1″-2″ long, sessile and crowded at the end of the rachis; leaflets 12-20 pairs, ·25″-·3″ by ·15″, sessile, coriaceous, linear-acute, glabrous above, adpressed-bristly on the

margins and under-side, obliquely rounded at the base. Flowers yellow, in small, ovoid or nearly globose heads ·25″-·3″ in diameter; peduncles ·75″-1″ long, densely bristly-hairy, solitary or in axillary pairs along the branches; bracts small, linear-acute, 3-veined, ciliolate. Calyx minute. Corolla pink, ·1″ long, divided at the top into 4, obtuse lobes. Stamens 4, much exserted. Pod ·5″-·75″ long, by ·15″ broad, flat, recurved, consisting of 3-5, one-seeded, glabrous, light-brown joints, separating from the persistent, spinulose sutures.

Native of Brazil. Naturalized in the Konkan and North Kanara; gregarious and spread over considerable areas in open situations in the moist coast region of N. Kanara (Coompta and Honawar), also along roadsides above the ghàts in the Sircy and Siddapore subdivisions; usually cultivated in gardens. Fl. rainy and cold seasons.

2. M. rubicaulis, Lam.; DC. Prodr. 2, 429; Fl. Br. I. 2, 291; Dalz. & Gibs. Bomb. Fl. 85; Brandis For. Fl. 172; Cooke Fl. Pres. Bomb. 1, 442; Gamble Ind. Timb. 290. *Hajeru,* Sind.

A large, straggling shrub or small tree; branches copiously armed with very sharp, yellowish, hooked prickles. Leaves bipinnate, 5″-7″ long; stipules ·25″ long, setaceous; pinnæ 5-12 pairs, shortly stipellate, the rachis without prickles; leaflets 6-12 pairs, membranous, ·25″-·3″ by ·12″, obliquely-oblong, shortly cuspidate, glabrous above, slightly pubescent beneath; midrib excentric; petiolules very short. Flowers 4-merous, pink, in fascicled axillary, pedunculate heads; peduncles 1″-2″ long, slender, pubescent, crowded at the ends of the branches; bracts small, setaceous. Calyx minute, ciliolate. Corolla ·12″ long, shortly 4-lobed. Stamens 8, long-exserted. Ovary stalked, glabrous. Pod 3″-4″ by ·5″, stipitate, glabrous, falcate, separating in 4-10, 1-seeded joints from the sutural frame which is usually without prickles.

Western Himalayas ascending to 5000′ in Kumaun and Sikkim, throughout the greater part of India; in the dry districts of the presidency and Sind in open semi-desert savannah lands. Bark grey, wood hard; sapwood yellowish-white; heartwood red. "The wood has been used for gunpowder charcoal, is of good quality but small." Gamble. Fl. Aug.-Sept. Fr. Nov.-Jan.

3. M. hamata, Willd.; DC. Prodr. 2, 427; Fl. Br. I. 2, 291; Dalz. & Gibs. Bomb. Fl. 85; Cooke Fl. Pres. Bomb. 1, 442; Gamble Ind. Timb. 290. *Arkur,* Vern.

A low, much branched, prickly shrub with pubescent branches covered with straight or hooked, yellowish prickles. Leaves bipinnate, 1″-4″ long; main rachis pubescent, sparsely covered with small, recurved prickles; stipules setaceous, hairy; pinnæ 3-6 pairs, ·25″-1″ long, with pubescent prickly rachises; leaflets 6-10 pairs ·15″ by ·08″, ovate-oblong, apiculate, oblique at the base, membranous,

glabrescent above, scarcely pubescent beneath; midrib slightly excentric. Flowers 4-merous, pink, in peduncled globose heads, axillary and crowded at the ends of the branchlets; peduncles slender, grooved, pubescent and glandular, sometimes with a few prickles; bracts small, setaceous. Calyx minute, shortly toothed. Corolla ·12″ long, deeply 4-lobed. Stamens 8. Pods 2″-3″ by ·5″, thin, glabrous, falcate, consisting of 4-8, one-seeded joints, separting from the prickly sutures when ripe; seeds ovoid, flattened, reddish-brown. Brandis (Ind. Trees, 263) states that specimens of *M. hamata,* Willd. from Bombay have been indentified at Kew with an American species *M. polyancistra,* Benth. Gamble (Ind. Timb. 290) and gives the Seshachellam hills in Cuddapah, Madras presidency, as a local habitat of this latter species. Specimens of *M. polyancistra,* from Cuddapah, collected by Gamble appear to me to be distinct from the well-known common form of *M. hamata,* so widely spread throughout the dry semi-desert and thorn-forest areas of the Bombay presidency.

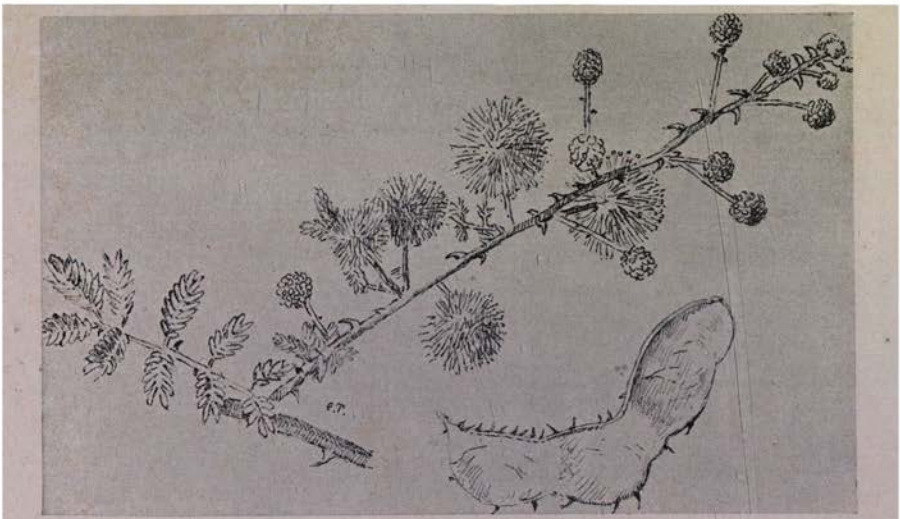


Fig 270. Mimosa hamata Willd.

Western peninsula; throughout the dry Deccan districts in open jungles on trap, often on black cotton soil; common on the Kuput range of hills in the Dharwar district. Fl. R. S. Fr. C. S. A straggling or low, densely-branched, prickly shrub. Bark brownish, thin. Wood hard; sapwood yellowish; heartwood red.

47. ACACIA, WILLD.

Erect or climbing, spinose and prickly shrubs or trees; spines stipular or infra-stipular. Leaves bipinnate; leaflets small, multijugate or reduced to a phyllode. Flowers usually yellow, in globose heads or cylindrical spikes, with numerous scaly bracteoles between the flowers, usually pentamerous. Calyx campanulate, shortly-toothed. Petals exserted, united in the lower half. Stamens free, indefinite, exserted. Ovary stalked or sessile, many-ovuled; style filiform; stigma minute. Pod ligulate or oblong, dehiscent or indehiscent.

Erect shrubs or trees. Spines stipular or infra-stipular.

Spines stipular, long, straight, uniform. Flowers in globose heads.

Pods straight.

Pods cylindrical, glabrous ... ... 1. A. Farnesiana

Pods thick, moniliform, tomentose ... ... 2. A. arabica.

Pods thin, narrow, glabrous; edges slightly repand ... ... 3. A. eburnea.

Pods thin, glabrous, ·5″ broad; edges straight 4. A. Jacquemontii.

Pods ligulate-falcate.

Pods somewhat torulose, glabrous when ripe 5. A tomentosa.

Pods not torulose, densely brown-tomentose 6. A. leucophlœa.

Spines stipular, long, straight, dimorphous.

Flowers in spikes ... ... 7. A. Latronum.

Spines infra-stipular, short, hooked. Flowers in spikes.

Spines in pairs. Pods not winged.

Bark white. Pinnæ 10-20 pairs ... ... 8. A. Suma.

Bark dark-brown. Pinnæ 20-40 pairs ... 9. A. Catechu.

Spines in pairs. Pods narrowly winged along the upper suture ... ... 10. A. ferruginea.

Spines ternate; lateral straight; middle-one hooked ... ... 11. A. Senegal.

Woody climbers armed with scattered prickles; stipular or infra-stipular spines wanting. Flowers in globose heads.

Pods thick, fleshy, red, rugose, partially indehiscent ... ... 12. A. concinna.

Pods thin, brown, smooth, dehiscent.

Leaflets less than 30 pairs.

Pinnæ 5-10 pairs; leaflets ·25″-·5″ long 13. A. Intsia.
Pinnæ 10-15 pairs; leaflets ·15″-·3″ long 14. A. cæsia.
Leaflets more than 40 pairs, ·2″-·25″ long 15. A. pennata.

1. A. Farnesiana, Willd. DC. Prodr. 2, 461; Fl. Br. I. 2, 292; Brandis For. Fl. 180; Bedd. Fl. Sylv. 52; Cooke Fl. Pres. Bomb. 1, 445; Gamble Ind. Timb. 292; *Vachellia Farnesiana*, W. & A.; Dalz. & Gibs. Bomb. Fl. Suppl. 26. *The Cassie Flower; Vilayati-babul, gukikar, dev-babul*, Vern.; *Jalli*, K.; *Kankri*, M.

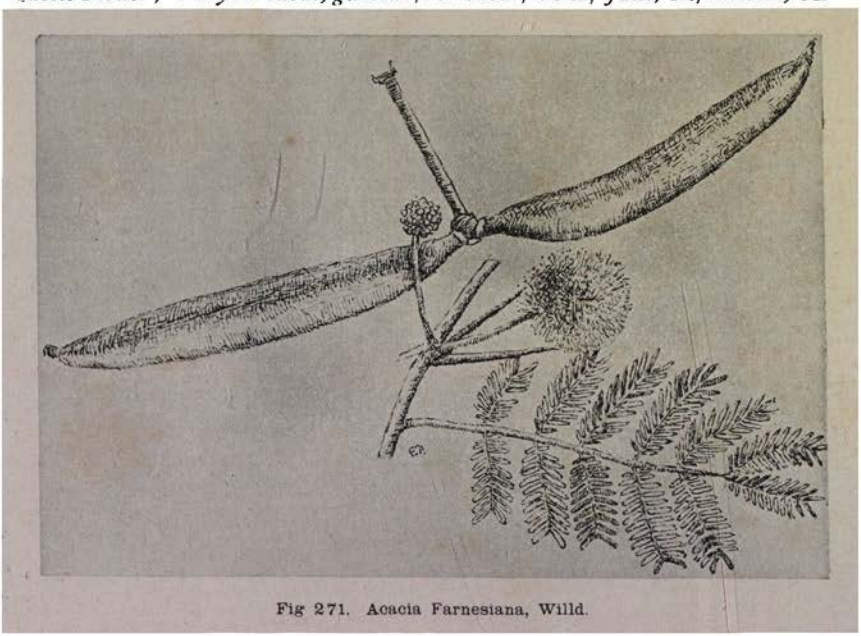


Fig 271. Acacia Farnesiana, Willd.

A thorny shrub; branches striate, glabrous, covered with pale-brown lenticels; stipular-spines white, straight, ·25″-·75″ long, hard, sharp, divaricate. Leaves bipinnate; rachis 1″-2″ long, angular, pubescent, with a small, raised gland about the middle of the petiole; pinnæ 4-8 pairs, ·75″-1·25″ long; leaflets 10-20 pairs, ·2″-·15″ by ·08″-·05″, linear-acute, glabrous, sessile; base rounded, oblique. Flowers bright-yellow, powerfully sweet-scented, in globose, fasciculate heads ·25″ in diameter; peduncles ·75″-1″ long, on axillary nodes with a ring of small, membranous bracts near the middle or close to the flowers. Calyx campanulate, very minute. Corolla ·1″ long; lobes short, triangular. Pod nearly cylindric, pointed at the ends, 2″-3·5″ long by ·5″ broad, glabrous, brown, veined, scarcely dehiscent; seeds in 2 series, imbedded in dry, spongy tissue.

Cosmopolitan in the tropics, but usually cultivated. Naturalized near villages

and in moist situations throughout the presidency and Sind; indigenous in Central America. Fl. Feb.-Mch. Bark light-brown, rough. Wood close-grained, hard and tough; sapwood white; heartwood red, irregular. Pores moderate-sized, single or in patches, often in interrupted bands of soft, resinous tissue. Medullary rays free, numerous; weighs about 50 lbs. to the cub. ft. The flowers, which are very strongly scented, yield on distillation an essence, called *Cassie*, much used in European perfumery. A gum exudes from the trunk which is collected in Sind. The bark is used in medicine and contains about 2 per cent. of tannin.

2. A. arabica, Willd.; W. & A. Prodr. 277; Fl. Br. I. 2, 293; Bedd. Fl. Sylv. 95; Dalz. & Gibs. Bomb. Fl. 86; Brandis For. Fl. 180; Cooke Fl. Pres. Bomb. 1, 443; Gamble Ind. Timb. 292. *Indian Gum Arabic Tree. Jali,* K.; *Babul, vedi-babul,* M.; *Kikar, ramkanti,* Vern.; *Babbar, kalikikar,* Sind.

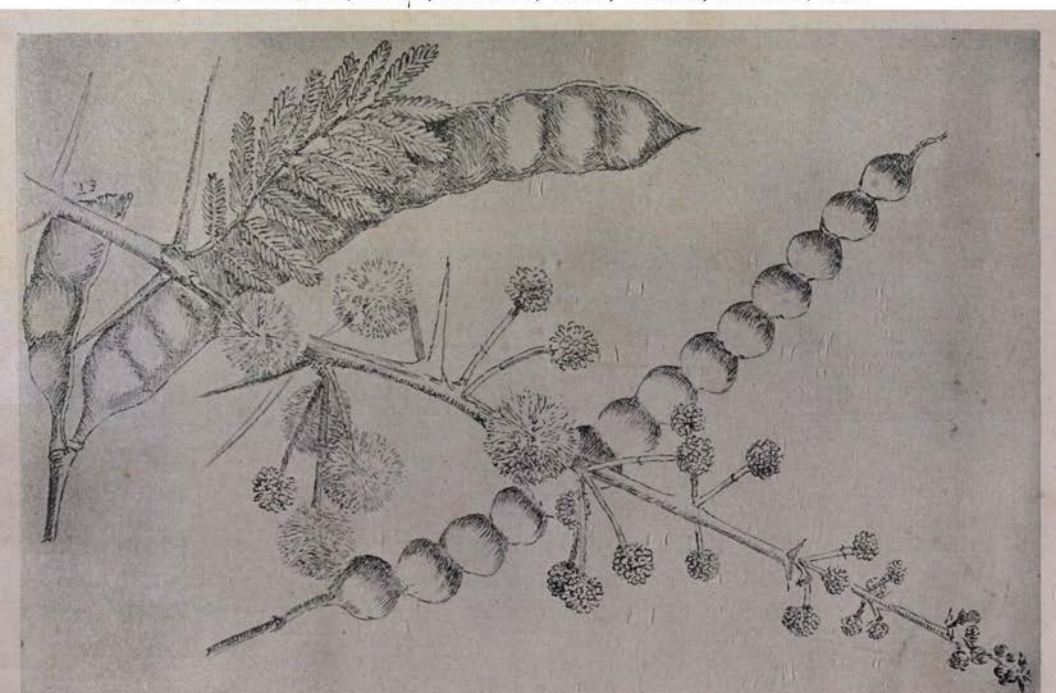


Fig 272. Acacia arabica, Willd.
(Lower fruit var. vediana.)

A large tree with a short, thick, cylindrical trunk; branchlets slender, pubescent when young; stipular-spines variable, ·25″-2″ long, white, sharp, straight,

sometimes wanting. Leaves bipinnate; rachis downy, 2″-4″ long; pinnæ 3-6 pairs, ·75″-2″ long, with a cup-shaped gland between the lowest and sometimes between the top pair; petioles 1″-2″ long; leaflets 10-20 pairs, ·12″-·25″ by ·05″-·1″, glabrous, linear-acute, sesssile, membranous, green. Flowers bright-yellow, in globose, fasciculate heads, about ·5″ in diameter; peduncles 2-6, short, slender, grey-downy with 2 opposite, scaly bracts about the middle. Calyx minute, membranous. Corolla campanulate, twice the calyx, ·12″ long. Pod stalked, 3″-6″ long by ·5″ broad, compressed, moniliform, contracted between the seeds, coriaceous, persistently white-tomentose, subindehiscent, 8-12-seeded; seeds ovoid, smooth, dark-brown.

Fig 273. Acacia arabica Willd.—*(Seedling.)*

Var. *cupressiformis*, Stewart Punjab Plants, 51; Cooke Fl. Pres. Bomb. 1, 444; Var. *Ramkanta*, Grah. Cat. 59; Dalz. & Gibs. Bomb. Fl. 86; *Ramkanti*, M.

This is more a sport than a true variety; it has the flowers and fruits of the type and differs only in the peculiar cypress like arrangement of its branches.

Ramkanti is fairly common in parts of the Poona district where it is considered to be a sacred tree by the Hindus.

Var. *vediana*, Cooke Fl. Pres. Bomb. 1, 444. This is a distinct variety and may eventually be separated from "*arabica*" as a species. *Vedi-babul* is distinguished from *Godi-babul* or true *Acacia arabica*, by its quicker growth and characteristic, fissured bark and by its very different pods which are flat, shortly stalked, 2·5″ by ·75″ and very little constricted between the seeds. The spines on *Vedi-babul* are also more numerous, stouter and whiter than in the type. *Vedi-babul* is quite as common as *Godi-babul* in the Deccan. The wood being only fit for firewood, *vedi-bubul* is kept out of the coupes under regeneration as far as possible.

Indigenous in the N. Deccan, including Berar and Khandesh, Rajputana, Guzerat and Sind; widely-planted and self-sown throughout the dry, hot regions of India; absent from the humid region along the Western coast also from the North-West provinces beyond the Jhelum river where frost is severe in winter. It is common in the lower valley of the Ganges and throughout the Deccan and Carnatic, often on black cotton soil, either in small open patches of forest or

as single trees scattered throughout the cultivated or waste savannah lands. Babul forms extensive pure or mixed-forests along the rivers in Poona, Ahmednagar and Sholapur districts of the Bombay presidency and in Sind along the Indus in inundated lands. Away from the effects of periodic flooding, *Babul* does not thrive with an annual rainfall of less than 20", even on black soil. Quite lately a very large area (over 50000 acres) of reserved forest in the Poona district where laborious efforts had been made over a long series of years to raise *Babul*, had to be disforested as it was found that the rainfall was insufficient even in good soil to produce anything but small, stunted and decaying stems of very little climatic or economic value.

In the reserves along the inundated banks of the Deccan rivers *Babul* although never very tall, attains to a considerable girth (8′ to 10′ and sometimes as much as 14′ under very favourable conditions). The spreading, branched, evergreen crown gives a dense shade, in consequence of which a grove of large *Babul* trees on the banks of a Deccan river forms an ideal camping ground; it is also an excellent roadside tree and is commonly planted along the main roads in the Deccan, Guzerat and Southern Mahratta Country districts. Gamble mentions a disadvantage from which avenues suffer in the Madras presidency where the *Babul* trees are attacked by a moth the caterpillar of which lets itself down by a thread from the branches and if it falls on the human skin causes an intolerable itching. I have not observed this caterpillar in the Bombay presidency. Outside India, *Babul* is found in Africa, Arabia, Egypt, Persia, Afghanistan and Ceylon. The young leaves appear in March and April and although the tree is never bare of leaves the foliage is sometimes very thin about the middle of the hot season. Flowers during the rainy season from June till October. The Fruit is ripe in December and January in the Deccan. Bark dark-brown, thick, rough with longitudinal deep cracks. Wood reddish-brown, hard, mottled with dark streaks. Pores moderate-sized or large, oval and subdivided, enclosed in interrupted, concentric bands of pale, loose tissue. Medullary rays fine, moderately broad, numerous and unequally distributed, prominent, shining on a radial-section. Weighs 54 lbs. to the cub. ft. The following are the principal economic uses of this very valuable tree. Wood durable if properly seasoned and made into cart-wheels, sugar and oil presses, rice-pounders, agricultural implements, such as ploughs, harrows etc.; also converted into handles for tools, tent-pegs and a multitude of other articles in general requirement. The *Babul* kurans of the Deccan are the chief source of firewood for Poona, Ahmednagar and other large towns. The forests on the banks of the Indus in Sind furnish or used to furnish most of the fuel consumed on the North-Western Railway. *Babul* is used for house-posts in various parts of the country and has been converted into railway sleepers. In Sind *Babul* is extensively used for boat-building (knees and crooked pieces.) The bark is used for dyeing and

tanning; and is commonly employed throughout the whole of India, it imparts a characteristic brownish-red colour to cotton cloth; it is also a powerful astringent and a decoction sometimes serves as a substitute for common soap. In times of scarcity it is mixed with flour and eaten. The bark of the root is much used in the preparation of native spirits. The unripe pods mixed with an iron salt makes very good ink. A gum similar to gum-arabic exudes from wounds in the bark. Deep wounds often heal with difficulty owing to the chemical action of the tannin or tannic acid producing a black acid fluid which prevents the wounds from easily closing up. The gum is collected in large quantities and is used in native medicine and in dyeing and cloth-printing. The pods are a favorite fodder for sheep, goats and domestic animals. Large quantities of lac are collected from *Babul* trees in Sind and Guzerat. The artificial reproduction of the species is attended with many difficulties in non-inundated areas. In the Deccan, for example, the expensive method of fully ploughing the whole area under regeneration before sowing the seed, appears to be the only satisfactory means of obtaining a good crop of seedlings. Natural reproduction in the kurans not regularly organized is sometimes however fairly successful.

3. A. eburnea, Willd.; DC. Prodr. 2, 461; Fl. Br. I. 2, 293; Dalz. & Gibs. Bomb. Fl. 85; Bedd. Fl. Sylv. 95; Brandis For. Fl. 183; Cooke Fl. Pres. Bomb. 1, 445; Gamble Ind. Timb. 294. *Murmati,* M.

Fig 274. Acacia eburnea, Willd.

A large shrub or small tree; branchlets glabrous or pubescent, brown-coloured; stipular-spines variable ·12″-2·5″ long, straight, smooth, ivory-white, united at the base. Leaves bipinnate, ·75″-1·25″ long; rachis hairy with a cup-shaped gland between the uppermost and lowest pairs of pinnæ; pinnæ 2-4 pairs, sessile, ·25″-·5″ long; leaflets 6-8 pairs, ·1″ long,

linear-acute, coriaceous, grey-green, glabrous. Flowers brownish-yellow with a disagreeable smell, in fasciculate, globose heads ·3″-·4″ in diameter; peduncles axillary, ·5″ long, slender, pubescent with a ring of bracts above the middle. Calyx minute, campanulate, shortly 5-toothed. Corolla ·12″ long; lobes ovate-oblong, acute. Pods linear, stalked, 3″-6″ by .25″, flat, slightly falcate, with undulate, thickened sutures, glabrous, brown, longitudinally-veined; seeds 6-10, ovoid, flattened, olive-green, areolate with a shallow depression on each face, attached to the suture by a slender, crumpled funicle as long as the seed itself.

Outer Eastern Himalayas to Kumaon and Oudh; Trans-Indus, Baluchistan, Sind and the Suliman range up to 3000′, Berar, the Deccan and Carnatic; dry and desert regions, especially near the coast of Ceylon; Afganistan and Arabia; common in the Southern Mahratta Country on stony, arid soil, also throughout the Deccan in thorn-forests, sometimes on black-soil. A small tree, scattered throughout its area of distribution, nowhere common. Fl. Nov.-Feb. Fr. Apl.-June. Bark rough, dark-grey. Wood hard, yellowish, often with a red heart-wood. Pores moderate-sized, subdivided and enclosed in wavy, irregular bands of soft tissue which are often interrupted. Medullary rays fine and moderately broad, wavy, distinct in the darker tissue. Weighs 52 lbs. to the cub. ft. Only used for fire-wood in the Deccan.

In the Ahmednagar and Poona districts branches of this tree are subject to the attacks of a fungus. *Æscidium esculentum*, Barcl. which causes the branchlets to swell and become distorted and covers them with a close, growth of club-shaped bodies containing brown spores. These growths are cooked and eaten as a vegetable by natives in the Poona district.

4. A. Jacquemonti, Benth. in Hook. Jour. Bot. 1, 490; Fl. Br. I, 2, 293; Brandis For. Fl. 183; Cooke Fl. Pres. Bomb. 1, 446; Gamble Ind. Timb. 294. *Ratobauli*, Guz.

A perfectly glabrous, bushy shrub with stiff flexuose, shining brown branches; stipular-spines 1′-2″ long, straight, white, united at the base. Leaves bipinnate; with a small gland on the rachis; pinnæ 2-4 pairs, ·25″-·5″ long; leaflets 5-10 pairs, ·1″-·12″ long, greyish-green, rigidly subcoriaceous. Flowers yellow, sweet-scented, in axillary, fascicled, pedunculate heads ·5″ in diameter. Calyx minute, campanulate; teeth short, deltoid. Corolla ·1″ long, twice the calyx; lobes ovate-oblong, acute. Pod stalked, straight, 2″-3″ long by ·5″ broad, reticulately or transversely veined, glabrous, 5-6-seeded; stalk ·25″-·5 long.

N. W. Provinces and Punjab. Plains of Sind, Guzerat and Rajputana; common in ravines and dry water-courses; Fl. Feb.-May. A small bushy, thorny shrub with polished stems and straight, pollshed, slender spines. Bark thin, smooth greyish-brown. "Wood white, hard. Annual-rings marked by a dark line. Pores scanty, moderate-sized to large, in concentric patches of light, loose tissue.

Medullary rays irregular, fine or moderately broad, well defined." Gamble. The bark gives a brown or black colour, and is also used as a tan. The bark of the root is used in the distillation of spirit.

5. A. tomentosa, Willd.; DC. Prodr. 2, 462; Fl. Br. I. 2, 294; Dalz. & Gibs. Bomb. Fl. 86; Bedd. Fl. Sylv. t. 48; Cooke Fl. Pres. Bomb. 1, 446; Gamble Ind. Timb. 291. *Anjar,* Vern.

A small tree; branches tomentose; stipular-spines straight, brown, up to 3·5″ long, from a broad base over ·5″ wide, inflated, pubescent when young, afterwards glabrous, brown or black. Leaves bipinnate; rachis 1·5″-3·5″, flat, very pubescent, channelled and with glands between the two uppermost pairs of pinnæ and another large gland on the petiole; pinnæ 6-10 pairs, 1″-2″ long; rachis densely pubescent; leaflets 8-16 pairs, linear-oblong, obtuse, ·12″-·2″ by ·05″-·06″, tomentose on both sides. Flowers white, in axillary, fascicled, globose heads ·5″-·6″ in diameter peduncles 1″ long, pubescent with a ring of bracts above the middle. Pod compressed, strongly falcate, 4″-5″ by ·5″ reddish, pubescent, ultimately glabrous; seeds ovoid, compressed, olive-green, areolate on both faces.

Bengal, Java, Southern India and Ceylon. Dalz. & Gibs. describe this species as rare in Khandesh and the Deccan but correct this statement on page 318 of the appendix to the Bombay Flora, stating that their specimens were from plants raised in the Dapuli botanical garden from imported seed. Very doubtfully indigenous in the Bombay presidency.

6. A. leucophlœa, Willd.; DC. Prodr. 2, 462; Fl. Br. I. 2, 294; Dalz. & Gibs. Bomb. Fl. 86; Bedd. Fl. Sylv. t. 49; Cooke Fl. Pres. Bomb. 1, 447; Gamble Ind. Timb. 295; Trimen Fl. Ceyl. 2, 12. *Hewar,* Vern.; *Haribaval,* Guz.; *Panharya,* M.; *Bili-jali, bellada,* K.

A moderate-sized or large, deciduous tree; branchlets pubescent; stipular-spines short, strong, straight, white or grey. Leaves bipinnate, 2″-3″ long; main rachis grey-pubescent with sessile, cup-shaped, absorbtion glands between each pair of pinnæ on the grooved, upper side; pinnæ 5-15 pairs, ·75″-1·5″ long, nearly sessile; leaflets 12-25 pairs, ·2″ long, linear-oblong, obtuse, coriaceous, grey, glabrous or pubescent. Flowers pale-yellow or white in small, globose heads, ·25″-·4″ in diameter, arranged in large, terminal, tomentose panicles; peduncles short with a ring of bracts about the middle. Calyx minute, ·05″ long. Corolla twice as long as the calyx; lobes subacute. Pods sessile, 4″-8″ by ·25″-·3″, flat, slightly curved, brown-tomentose, thickened on the sutures, subindehiscent, 10-20-seeded; seeds compressed, black, areolate.

Plains of the Punjab and North-West Provinces to Ceylon, Burma and Malay Islands. Throughout the dry Deccan districts; common in the Southern Mahratta Country in dry open thorn-forests. Fl. Aug.-Sept. Fr. C. S. A mode-

Fig 275. Acacia leucophlœa, Willd.

rate-sized, deciduous tree. The inflorescence in large, terminal panicles is very conspicuous and characteristic. Bark thick, pale yellowish-white, dark-brown in very old trees, exfoliating in patches. Sapwood large; heartwood brick-red, streaked. Pores moderate-sized, uniformly distributed in short concentric irregular patches of soft tissue, alternating with dark-coloured, firm tissue. Medullary rays white, fine, numerous. Weighs 54 lbs. to the cub. ft. The hard, tough and strong wood takes a good polish but is rather brittle; yields a very good fuel. The bark is eaten mixed with flour in times of scarcity, it also furnishes a tough fibre used in making nets and cordage. The branches are often attacked by an insect and in consequence covered with woody galls.

7. A. Latronum, Willd.; DC. Prodr. 2, 460; Fl. Br. I. 2, 296; Bedd. Fl. Sylv. 95; Dalz. & Gibs. Bomb. Fl. 87; Brandis For. Fl. 180; Cooke Fl. Pres. Bomb. 1, 449; Gamble Ind. Timb. 299. *Dontmullina, hod-jali*, K.; *Dev-babul, bhes*, M.; *Tumbuti* in Dharwar.

A glabrous, gregarious shrub or small tree with an umbrella-like crown; branches brown; lenticellate; stipular-spines of 2 kinds; pairs of one kind solid,

Fig 276. Acacia leucophlœa, Willd. *(Seedling.)*

slender, ·5″-1″ long, of the other 2″ long and ·3″ in diameter at the base, stout, hollow, straight, sharp, and ivory-white. Leaves bipinnate, often fascicled on arrested branchlets, ·5″-1·5″ long; rachis slightly pubescent with a gland about the middle of the petiole; pinnæ 2-5 pairs, shortly stalked; rachis ·25″-·5″ long, pubescent; leaflets 6-15 pairs, linear, subacute, ·15″ by ·06″, coriaceous, glabrous; petiolules very short or O. Flowers at first white, afterwards turning yellow, fragrant, in lax, axillary spikes 1·5″-2″ long. Calyx minute, campanulate; teeth short, ciliolate. Corolla twice as long as the calyx, broadly triangular-toothed, glabrous. Pods thin, dehiscent, shortly stalked, falcate, broadly obtuse at the ends, dark-brown, shining, 1·5″-2″ by ·5″-·75″; seeds 2-4, ovoid, compressed, olive-green with small areoles on both sides.

Western peninsula and Southern India; common in the dry plains of the Deccan. Fl. Jan.-Mch. A small tree with a flattened umbrella-like crown, often gregarious. The spines are of two kinds, one large, white, conical and hollow, often tenanted by large black pugnacious ants; the other slender and shorter.

8. **A. Suma,** Kurz. in Brandis For. Fl. 187; Fl. Br. I. 2, 294; Cooke Fl. Pres. Bomb. 1, 447; Gamble Ind. Timb. 295; *A. Catechu,* W. & A. Prodr. 272; Bedd. Fl. Sylv. t. 49; Dalz. & Gibs. Bomb. Fl. 86. *Kamtiya,* M.; *Banni-mara, mugli,* K.

A large or medium-sized tree; branchlets grey-pubescent; stipular-spines short, straight or hooked, smooth, from a broad base. Leaves bipinnate, 4″-9″ long; rachis grooved, angular, pubescent, furnished with a conspicuous, large, cupular gland on the petiole below the lowest pair of pinnæ also with other smaller glands mostly between the upper pairs of pinnæ; pinnæ 10-30 pairs, 1·5″-2·5″ long, shortly stalked; leaflets 20-50 pairs, sessile, linear-obtuse, ·25″ by ·05″, pale-green, coriaceous, glabrous. Flowers white or pale-yellow in sessile, lax, simple or fascicled, axillary, peduncled spikes, 3″-4″ long, with a grey more or less tomentose rachis; peduncles 1·25″ long. Calyx campanulate, ·1″ long, grey-pubescent; teeth short, triangular, acute. Corolla ·1″-·12″ long, scarcely exceeding the calyx; lobes narrow-oblong, subacute. Pods stalked, 3″-5″ by

·5″-·75″, with a triangular beak at the apex, narrowed into a short stalk at the base, thickened on the margins, reticulately veined, pubescent when young, at length glabrous, 6-8-seeded. Bengal, Behar, Upper Burmah, Western peninsula and Ceylon. In North Kanara near the Dharwar frontier and in the Southern Mahratta Country; usually in moist places, along nalas, not common. Fl. H. S. Fr. Sept.-Oct. A moderate-sized tree with white bark, exfoliating in papery flakes and marked at intervals by horizontal patches of darker colour. The wood is very similar to that of *Acacia Catechu,* with more numerous pores and finer medullary rays. Bark used as a tan. *Cutch* is prepared from the wood.

9. A. Catechu, Willd. Sp. Pl. IV, 1070; Fl. Br. I. 2, 295; Bedd. Fl. Sylv. t. 49; Dalz. & Gibs. Bomb. Fl. 86; Cooke Fl. Pres. Bomb. 1, 448; Gamble Ind. Timb. 296; Brandis For. Fl. 186; Ind. Trees, 267; *A. sundra,* DC. Prodr. 2, 458; Fl. Br. I. 2, 295; Dalz. & Gibs. 86; Bedd. Fl. Sylv. t. 50. *Catechu, Cutch Tree, Catechu-Nigrum, Pegu-Catechu. Khair, kaderi, lal-khair,* M.; *shemi,* K.

Fig 277. Acacia Catechu, DC. *(Var. Sundra.)*

A moderate-sized, gregarious, deciduous tree with dark-brown, glabrous, shining branchlets; stipular-spines short, hooked, from a broad base. Leaves bipinnate, 4″-6″ long; rachis pubescent or glabrous shining, with a large, conspicuous, cup-shaped gland about the middle of the petiole and smaller glands between the other pairs of pinnæ; pinnæ 10-20 pairs 1″-2″ long; rachis pubescent along the margins on the grooved upper side or quite glabrous; leaflets 30-50 pairs, linear, subacute or obtuse, sessile, ·3″ by ·05″, crowded, pale-green, ciliate or quite glabrous. Flowers pale-yellow in lax, cylindrical simple or fascicled, axillary spikes, 2″-4″ long, sessile. Calyx campanulate, ·05″ long, glabrous. Pods stalked, strap-shaped, thin, straight, 2″-4″ long by ·4″-·6″ broad, brown, shining, reticulately veined, beaked at the apex, narrowed into a stalk ·25″ long, 3-10-seeded.

There are 3 varieties of *Khair.* (1) Var. *Catechu,* Calyx, petals and leaf-rachis hairy, N. Kanara and the Konkan. (2) Var. *catechuoides,* Calyx and

petals glabrous; leaf-rachis puberulous. Bengal, Sikkim, Assam, Burmah, apparently absent from the Western peninsula. (3) Var. *Sundra*, Deccan, Guzerat, Rajputana, Southern Mahratta Country etc. quite glabrous throughout. All the varieties have in common with other *Acacias* the rachis of the leaf and pinnæ channelled, pubescent or glabrous and furnished with sessile, absorbtion glands.

Generally throughout India and Burmah; the Himalayas, ascending to 5000′ in Sikkim, Pegu, dry regions of Ceylon. In the Bombay Presidency it is found in the Guzerat, Deccan, ascending to 3700′ in the Khandesh Akrani, and Southern Mahratta Country districts, mixed with other, mostly thorny species, in the dry open thorn-forests, on arid, stony soil, (Var. *Sundra*). In N. Kanara and the Konkan it occurs nearly pure in larger or smaller patches on the low level, physiologically dry laterite, near the seacoast. It is also found sporadic in the moist monsoon-forests of these districts but always under xerophitic conditions of soil (Var. *Catechu*). Fl. July to Sept. Fr. C. S. A moderate-sized, deciduous, thorny tree. Bark dark-grey or brown, rough, fissured, exfoliating in long narrow strips. Wood very hard, smooth and dense; sapwood large, yellowish-white; heartwood dark brick-red. Pores uniformly distributed, each enclosed in a ring of soft, light-coloured tissue, arranged in interrupted concentric bands. Medullary rays short, fine and very distinct on a cross section. Weighs 66 lbs. to the cub. ft. (Var. *Catechu.)* Catechu-wood resists the attacks of Teredo navalis and is not touched by white ants; it is very durable, sound pieces of apparently great age having been taken from the excavation of the Prince's dock in the Bombay harbour; it takes a fine polish and is easily seasoned; used for agricultural implements, oil and sugar mills, house posts, wheels of carts etc. The most valuable economic product of the tree is however *Catch* or *Kath*. The latter is a pale cinnamon-coloured, astringent, biscuit-like substance used for chewing with betel-nut; it requires careful preparation and commands a high price. *Kath* is not soluble in water. *Catechu* or *Cutch* is a less carefully prepared product or extract with a shining black or brown fracture. *Cutch* is exported to Europe for dyeing and tanning purposes and is largely consumed in India like *Kath* for chewing purposes; it is also used medicinally and is soluble in water. Catechu-wood yields an excellent fuel and is converted into good charcoal specially suited for blacksmith's work. In the Surat Dangs holes are cut in the trees with a chisel to ascertain whether they will give good *catechu* or not. This is a wasteful custom which should not be allowed as the trees are much damaged by these trial borings. In N. Kanara I have not observed that any such borings are found necessary. The variety found there on laterite is the gregarious *Catechu* whereas in the Dangs the variety *Sundra* appears to prevail. There are no working plans specially made for Catechu areas in the Bombay Presidency. Hitherto the right to extract the product has been farmed out to contractors

when the trees are considered to have arrived at maturity and are estimated to yield a remunerative revenue. Carefully prepared plans for the *Catechu* forests in all the Bombay circles are urgently required. No attention has hitherto been paid to the reproduction of "*Catechu*" in exploited areas in the Bombay Presidency and as contractors have in many instances been allowed to remove the roots which give excellent *Cutch* a considerable amount of damage to the forests has consequently resulted. *Catechu* is reproduced naturally by seeds and root-suckers, it also coppices freely and consequently natural regeneration presents fewer difficulties than are found in the case of the closely allied *Babul.*

10. A. ferruginea, DC. Prodr. 2, 458; Bedd. Fl. Sylv. t. 51; Brandis For. Fl. 185; Cooke Fl. Pres. Bomb. 1, 448; Gamble Ind. Timb. 298. *Pandhra-khair,* M.; *Kaiger,* Vern.

A large, deciduous tree; branchlets glabrous; twin stipular-spines short, straight or hooked. Leaves bipinnate, 2″-4·5″ long; rachis slender, grooved, with a large gland on the petiole and another between the uppermost pair of pinnæ; pinnæ 4-6 pairs, 2″-3″ long, shortly stalked; the stalks thickened at the base and the rachis slender, grooved; leaflets 15-30 pairs, linear-oblong, obtuse, ·25″-·3″ by ·1″, coriaceous, glabrous, unequal-sided at the base, glaucous-green above, paler beneath; petiolules very short. Flowers pale-yellow, sessile, in numerous slender, axillary spikes, 3″-4″ long, which are often panicled at the ends of the branches. Calyx campanulate, ·06″ long; teeth distinct. Corolla twice as long as the calyx; lobes lanceolate, acute. Pods 3″-5″ by ·75″-1″, thin, glabrous, brown, reticulately veined, very narrowly winged along the upper suture, ultimately dehiscent; 4-8-seeded.

Western Peninsula, North Bengal, dry country of Ceylon and Central India, Panch Mahals, Konkan, and Guzerat in thorn-forests. Fl. R. S. Fr. Jany.-Feb. A large, deciduous tree. Bark rough. Heartwood olive-brown, extremely hard; weighs about 70 lbs. to the cub. ft.; used for agricultural implements, carts and building purposes. Yields a gum similar to gum-arabic.

11. A. Senegal, Willd.; DC. Prodr. 2, 459; Fl. Br. I. 2, 295; Cooke Fl. Pres. Bomb. 1, 449; Gamble Ind. Timb. 299; *A. rupestris,* Stocks; Brandis For. Fl. 184. *Khor,* Sind.

A small tree with grey, smooth, shining, flexuose branches; young parts pubescent; infra-stipular spines usually 3, stout, conical, sharp, brown, shining; the 2 lateral nearly straight, the middle one recurved. Leaves bipinnate, ·75″-1·25″ long; rachis often minutely prickly and pubescent with a gland on the petiole below the lowest pair of pinnæ and one between the uppermost pair; pinnæ 3-5

pairs, ·5″-·75″ long; rachis pubescent; leaflets 8-15 pairs, ·08″-·12″ by ·05″, linear, glaucous; petiolules very short. Flowers white, fragrant, in lax, pedunculate spikes 2″-4″ long. Calyx campanulate, ·08″ long; teeth distinct. Corolla white, twice as long as the calyx; lobes acute. Stamens with white filaments and lemon-yellow anthers. Pods shortly stalked, 3″ by ·75″, thin, straight, pubescent, flexible, when young glabrous, pale-brown when ripe, ultimately dehiscent, 5-6-seeded.

Sind and Ajmere, Western Africa north of the river Senegal. Dry rocky hills in Sind, Aravalli range and the Punjab. Fl. and Fr. Dec. Bark smooth, greenish-grey, shining. Wood hard; sapwood yellowish-white; heartwood nearly black. Pores moderate-sized to large, scanty, in large, concentric patches of light tissue. Medullary rays numerous, fine, white, bent near the pores. One of the principal sources of the commercial gum-arabic.

12. A. concinna, DC. Prodr. 2, 464; Fl. Br. I. 2, 296; Dalz. & Gibs. Bomb. Fl. 87; Brandis For. Fl. 188; Cooke Fl. Pres. Bomb. 1, 450; Gamble Ind. Timb. 291. *Sigekai, shige*, K.

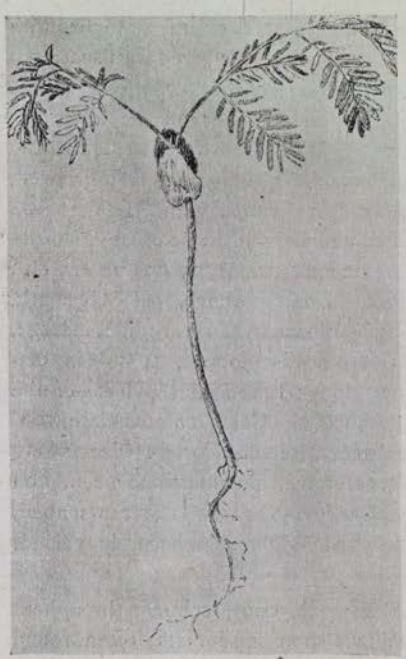


Fig 278. Acacia concinna, DC.—*(Seedling).*

A large, woody climber; branches smooth, grey, shining, closely dotted with small, white lenticels and covered with scattered, curved, grey prickles. Leaves bipinnate, 2″-4″ long; rachis angular, armed with strong, hooked, sharp, brown-pointed, grey prickles, and with a large gland about the middle of the petiole and smaller glands between the two uppermost pairs of pinnæ; stipules ovate, acute, cordate, caducous; pinnæ 4-6 pairs, 1″-2·5″ long, with a slender flattened and grooved rachis ending in a weak spine; leaflets 12-20 pairs, not closely set and overlapping, linear, glabrous, ·25″-·5″ by ·05″-·1″, unequal-sided at the base, subcoriaceous. Flowers yellow, in fascicled, pedunculate, globose heads ·25″-·4″ in diameter, forming large, racemose panicles at the ends of the branches; peduncles 1″-1·5″ long; bracts large, membranous, veined. Calyx ·1″ long; teeth lanceolate. Corolla not much exserted. Pods shortly stalked, linear-

oblong, 3″-5″ by ·75″-1″, thick, fleshy, red, dehiscing at intervals along the sutures when quite dry; wrinkled when dry and usually indented along both the sutures, 6-10-seeded.

Tropical jungles throughout India; common in the Konkan and North Kanara moist monsoon-forests. Fl. Mch.-July. Fr. ripe C. S. The stems are very prickly when young, but most of the sharp prickles soon disappear.. Stems sometimes more or less angled and 8″ or more in diameter. Bark smooth, grey, mottled, reddish within, ·25″ thick. Wood reddish-grey, smooth, moderately hard. Pores large or medium-sized, often subdivided, scattered. Medullary rays moderately-broad, crossed obliquely by continuous wavy, close lines of light-coloured tissue. Weighs about 52 lbs. to the cub. ft. The fruit is used as a substitute for soap and is exported in considerable quantities from the Konkan ghât, North Kanara and Belgaum districts.

13. A. Intsia, Willd. in DC. Prodr. 2, 464; Fl. Br. I. 2, 297; Dalz. & Gibs. Bomb. Fl. 88; *A. cæsia,* W. & A. Prodr. 1, 278; Brandis For. Fl. 189 in part; Cooke Fl. Pres. Bomb. 1, 450; Gamble Ind. Timb. 300. *Chilar,* M.

A large, scrambling or climbing, sometimes a semi-erect shrub; branches with 6-8 grooves, brown, lenticellate and more or less tomentose, covered with scattered small, hooked prickles. Leaves bipinnate, 4″-8″ long; rachis strongly grooved, pubescent or tomentose, usually armed with hooked prickles on the underside and furnished with sessile or short, columnar glands between the lowest and the 1-4-uppermost pairs of pinnæ; pinnæ 5-10 pairs, 2″-3″ long with a 2-grooved, pubescent rachis prolonged into a short, weak spine with a gland between the uppermost pair of leaflets; leaflets 10-25 pairs, obliquely-linear or oblong, shortly and obliquely mucronate; base truncate, very unequal-sided, ·25″-·5″ by ·15″-·3″, sub-sessile, dark-green, pubescent or glabrous, shining above, paler beneath, 3-basal-nerved; midrib close to the upper edge. Flowers yellowish-white, in large, terminal, tomentose, bracteate, panicled heads; heads globose, ·4″-·6″ in diameter; peduncles tomentose, fascicled, ·3″-·75″ long; bracts at the base of the peduncles linear, acute, falcate, ·25″ long, caducous. Calyx campanulate, ·08″ long with 5 obtuse, dark-brown, glandular-pubescent teeth. Corolla twice as long as the calyx, lobed to below the middle, dark-brown, glandular-pubescent and minutely hooded at the apex. Pods shortly stalked, 4″-6″ by ·75″-1″, strap-shaped, thin, flat, brown-tomentose when young, afterwards glabrous, obscurely veined, dehiscent, 6-12-seeded.

Tropical India and Burmah, also in Sikkim up to 5000′; common throughout the presidency from the coast inland in deciduous monsoon-forests; often found as a semi-erect shrub on the laterite of the Mahableshwar plateau. Fl. Apl.-Aug. Fr. C. & H. S. A large climber with grey bark. Wood white, soft, porous.

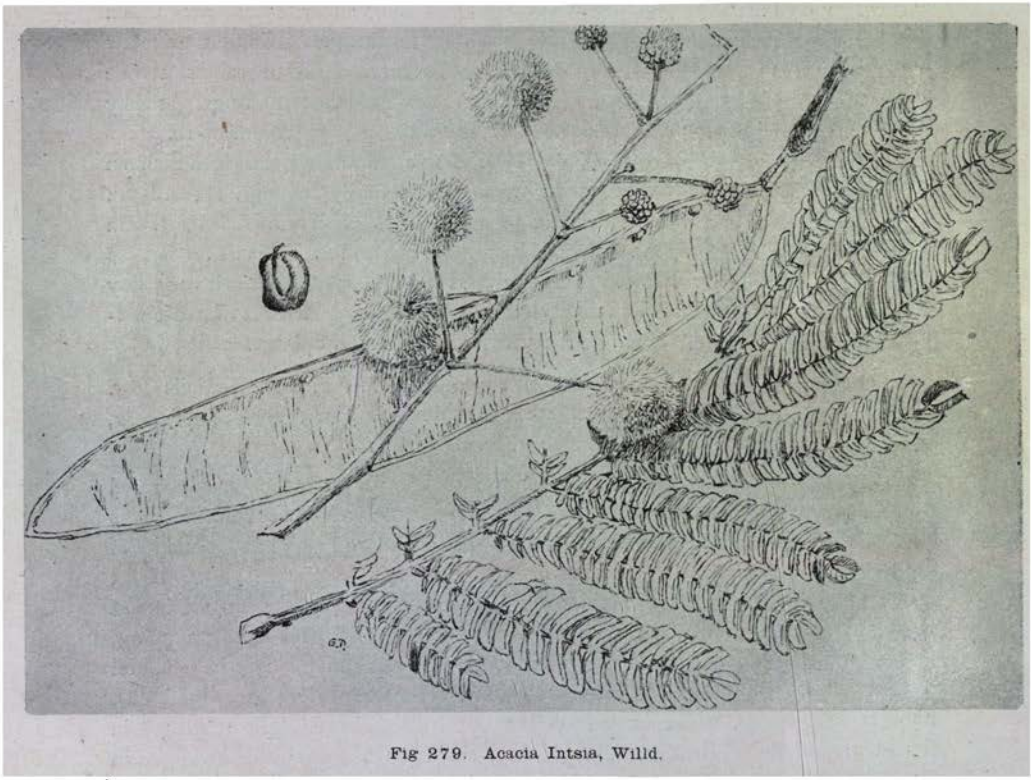


Fig 279. Acacia Intsia, Willd.

14. A. cæsia, W. & A. Prodr. 278; Dalz. & Gibs. Bomb. Fl. 87. Cooke Fl. Pres. Bomb. 1, 451; Prain Jour. As. Soc. Beng. 66, 510; *A. Intsia,* Var. *cæsia,* Baker Fl. Br. I. 2, 297.

A scandent, climbing shrub; branches grey-tomentose, more or less grooved, covered with scattered, small, deflexed prickles. Leaves bipinnate, 4″-8″ long; rachis pubescent, grooved, more or less armed with hooked prickles along the under-side, with a sessile gland on the petiole below the lowest pair and one or more between the uppermost pairs of pinnæ; pinnæ 10-15 pairs, shortly stalked; rachis 1·5″-2·5″ long, very slender, pubescent, 2-grooved on the upper side and terminating in a very short, weak spine; leaflets 15-20 pairs, sessile on the ridge between the grooves on the upper side of the rachis, ·12″-·15″ by ·05″-·06″, linear, very unequal-sided, mucronate, glabrous or slightly pubescent above, pubescent and pale beneath, 3-basal-nerved; midrib near the upper edge of the leaflet. Flowers in terminal, or axillary panicled, pedunculate, globose heads ·4″

in diameter; peduncles bracteate at the base, 5″-1″ long, softly tomentose. Calyx ·06″ long; lobes subacute, shortly white-ciliolate at the apex. Corolla twice as long as the calyx, divided halfway down; lobes acute, dark-puberulous at the apex. Pods strap-shaped, thin, 4″-6″ by 1″, tomentose or glabrous, broadly triangular, beaked and narrowed into a short stalk at the base; seeds 5-10.

Same area of distribution as *Acacia Intsia*, with which species it has been united by Baker in the Flora of British India. Bentham *(Mimoseæ)*, Trans. Linn. Soc. 30, 530, following Brandis For. Fl. 189 also unites *cæsia* with *Intsia*. Prain however separates them, Jour. As. Soc. Beng. 66, 510 and maintains the two as distinct, stating that the crowded leaflets always hairy beneath makes it very easy to recognise *A. cæsia*, even in the herbarium and that no one dreams of confounding the two when they are seen growing. I agree with this opinion.

15. A. pennata, Willd.; Sp. Pl. 4, 1090; Fl. Br. I. 2, 297; Brandis For. Fl. 189; Cooke Fl. Pres. Bomb. 1, 451; Gamble Ind. Timb. 300; *A. pinnata*, Dalz. & Gibs. Bomb. Fl. 87. *Shembi, shemberti,* M.

A scandent, climbing shrub with glabrous, shining branches, copiously armed with small, scattered, recurved prickles; young parts grey-pubescent. Leaves bipinnate, 4″-6″ long; rachis puberulous, brown, with a large gland about middle of the petiole and 2-3 smaller between the uppermost pairs of pinnæ; pinnæ 10-15 pairs; rachis channelled, 1·5″-2·5″ long, ciliate on the margins, prolonged into a short soft spine at the apex; leaflets 40-50 pairs, closely packed, overlapping, sessile on raised points or on a pubescent ridge along the middle of the channel in the rachis, ·2″-·25″ by ·05″, linear, obtuse, truncate at the base, glabrous. Flowers in globose, white or pale-yellow, peduncled heads less than ·5″ in diameter; peduncles slender, ·5″-·75″ long, single or 2-4-fascicled, arranged in terminal or axillary, long raceme-like panicles; bracts linear, minute. Calyx campanulate, ·1″ long; teeth triangular, glabrous. Corolla longer than the calyx; lobes obtuse, glabrous. Pods stalked, 4″-8″ by ·6″-1·25″, straight, strap-shaped, triangular-acute at the apex, narrowed into the short stalk, brown or yellow, glabrous, shining, with thickened, repand sutures; seeds 8-14, ·25″-·5″ long, compressed, ovoid, black or brown-shining, areolate on both faces.

Oudh, Kumaun, Nepal, Eastern Bengal, Burmah, Western and Southern India. Throughout the presidency, common in the Konkan and North Kanara monsoon-forests, ascending to 3700′ in the Khandesh Akrani. Fl. June-Aug. Wood reddish, porous, moderately-hard. The bark is used for tanning in North Kanara.

48. ALBIZZIA, Durazz.

Unarmed trees or shrubs. Leaves bipinnate. Flowers usually pentamerous (in the Indian species), in large, globose heads. Calyx toothed. Petals 4-5,

united below, valvate. Stamens indefinite, exserted; filaments united at the base. Ovary sessile or shortly stalked; style filiform; stigma capitate. Pod thin, flat, broad, continuous within, indehiscent or 2-valved; seeds compressed.

Pinnæ 2-8 pairs; leaflets ·5″-2″ long.

Flower-heads in short, corymbose racemes.

Pinnæ 2-3 pairs ... ... 1. A. Lebbek.

Flower-heads in large panicles.

Pinnæ 3-8 pairs; leaflets 10-25 pairs, ·75″-1″ long 2. A. odoratissima.

Pinnæ 3-5 pairs; leaflets 6-10 pairs, 1″-1·5″ long ... ... 3. A. procera.

Pinnæ 6-20 pairs; leaflets about ·25″ long.

Stipules broad, cordate ... ... 4. A. stipulata.

Stipules minute ... ... 5. A. amara.

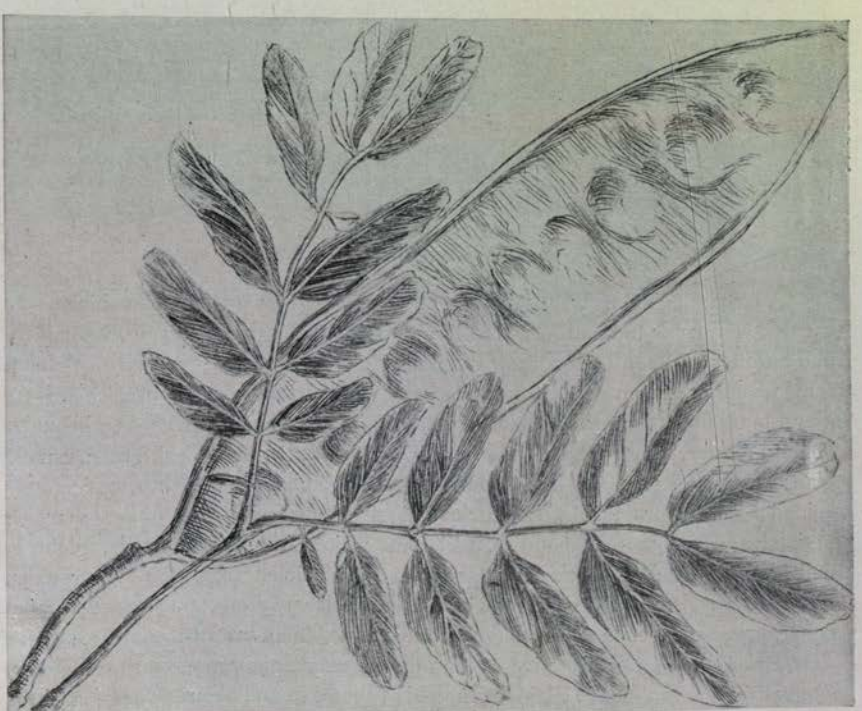


Fig 280. Albizzia Lebbek, Benth.

1. A. Lebbek, Benth. in Hook. Lond. Jour. Bot. (1844), 89; Fl. Br. I. 2, 298; Dalz. & Gibs. Bomb. Fl. 1, 88; Bedd. Fl. Sylv. t. 53; Brandis For. Fl. 176; Cooke Fl. Pres. Bomb. 1, 452; Gamble Ind. Timb. 303. *The Siris Tree. Sirsul,* K.; *Chichola,* M.; *Siris, harreri,* Vern.

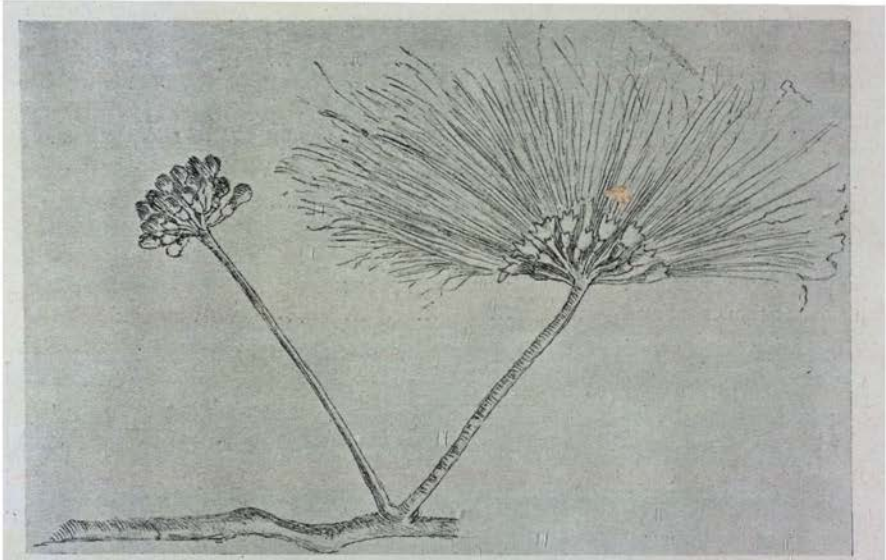


Fig 281. Albizzia Lebbek Benth.—*(Flowers.)*

A large, deciduous tree; shoots pubescent or glabrous. Leaves bipinnate; rachis glabrous or tomentose with a large gland on the petiole about the middle and another between the end pair of pinnæ; pinnæ 1-3 pairs; rachis 2″-5″ long, tomentose, pubescent or glabrous, channelled and with a large, usually peltate gland between each pair of leaflets; leaflets 3-8 pairs, subcoriaceous, obliquely-oblong, obtuse, 1″-1·75″ by ·6″-·75″, unequal-sided at the base, dark-green, usually glabrous above, more or less brown-tomentose and pale beneath, reticulately veined; midrib prominent, excentric and slightly nearer the upper margin; petiolules very short, tomentose. Flowers white, fragrant, in large, globose, umbellate heads; peduncles 1·5″-3″ long, 2-4-fascicled from the upper axils, forming short, corymbose, leafy racemes; pedicels ·1″ long, pubescent; bracts linear, tomentose, caducous. Calyx turbinate, ·15″ long, brown-tomentose; teeth short, triangular. Corolla twice as long as the calyx, glabrous; teeth triangular, acute. Stamens with the filaments united at the base and about 1″ long; anthers minute. Pods large, 4″-12″ by 1·75″, thin; seeds 6-12, compressed, small, pale-brown, foveolate on both the faces.

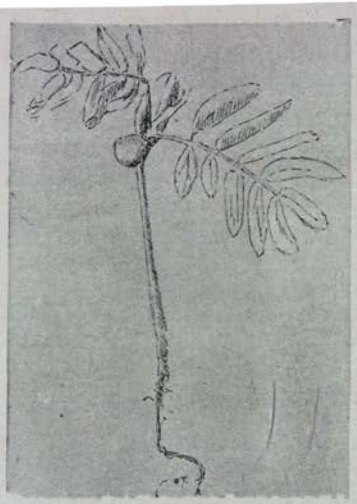


Fig 282. Albizzia Lebbek, Benth.-*(Seedling).*

Sub-Himalayan region from the Indus eastwards, ascending to 5000', Bengal, Burmah, dry regions of Ceylon, Southern, Central and Western India, ascending to 3700' in the Khandesh Akrani; scattered throughout the presidency in dry and moist monsoon-forests; commonly planted along roadsides. Fl. Apl.-May. Fr. Sept.-Mch. A large deciduous tree. Bark grey or brown, rough. Wood: sapwood large, white; heartwood dark-brown, mottled, hard, shining, with longitudinal streaks. Pores moderate-sized to large, usually scanty, often subdivided, in rings of soft, light-coloured tissue, also in groups or short lines. Medullary rays fine, short, usually distinct. Weighs about 55 lbs. to the cub. ft. Similar in structure to the wood of *A. procera;* yields an excellent timber of which large quantities from the Andamans have been placed on the London market. The "burrs" are especially valuable and fetch a much higher price than the wood which is used for furniture, picture frames, house-building, canoes, etc. *Siris* probably yields most of the wood known in Europe as *East Indian Walnut.*

2. A. odoratissima, Benth. in Hook. Jour. Bot. 1844, 88; Fl. Br. I. 2, 299; Dalz. & Gibs. Bomb. Fl. 88; Bedd. Fl. Sylv. t. 54; Brandis For. Fl. 175; Cooke Fl. Pres. Bomb. 1, 304; Gamble Ind. Timb. 304. *Godhunchi, bilkumbi,* K.; *Siris,* M.; *Kalo-sarasio,* Guz.; *Kali-saras* or *harreri,* Panch Mahals; *Chickla,* Bhil.

A large, deciduous tree; young parts pubescent. Leaves abruptly bipinnate; rachis 4″-8″ long, brown-pubescent with a single, large, sessile gland on the petiole below the lowest pair of pinnæ and another between the uppermost pair; pinnæ 3-6 pairs, 3″-6″ long; rachis channelled, pubescent and glandular between one or more of the uppermost pairs of leaflets; leaflets 10-20 pairs, sessile, ·70″-1·1″ by ·3″-·5, obliquely-oblong, rounded or subacute, apiculate at the apex, very oblique at the base, very unequal-sided, the midrib near the upper margin and parallel with it, subcoriaceous, dark-green, glabrescent above, pale sometimes glaucous and more or less pubescent beneath. Flowers white, very fragrant, sessile, in numerous 10-12-flowered peduncled heads, ·75″-1″ in diameter, disposed in axillary, leafy panicles at the ends of the branchlets; buds ovoid, pubescent or tomentose, about ·1″ long; peduncles single or 2-4-fascicled, ·25″

long. Calyx ·05″ long; teeth minute. Corolla greenish, ·2″ long, divided halfway to the base; teeth ovate, acute. Stamens about 20; filaments ·75″-1″ long, white; anthers minute, green. Style filiform as long as the filaments, green; stigma acute. Pods brown, shortly stalked, strap-shaped, 4″-8″ long by 1″-1·5″ broad, thin, flexible, glabrous, veined above the seeds; seeds 9-12, flattened, yellow.

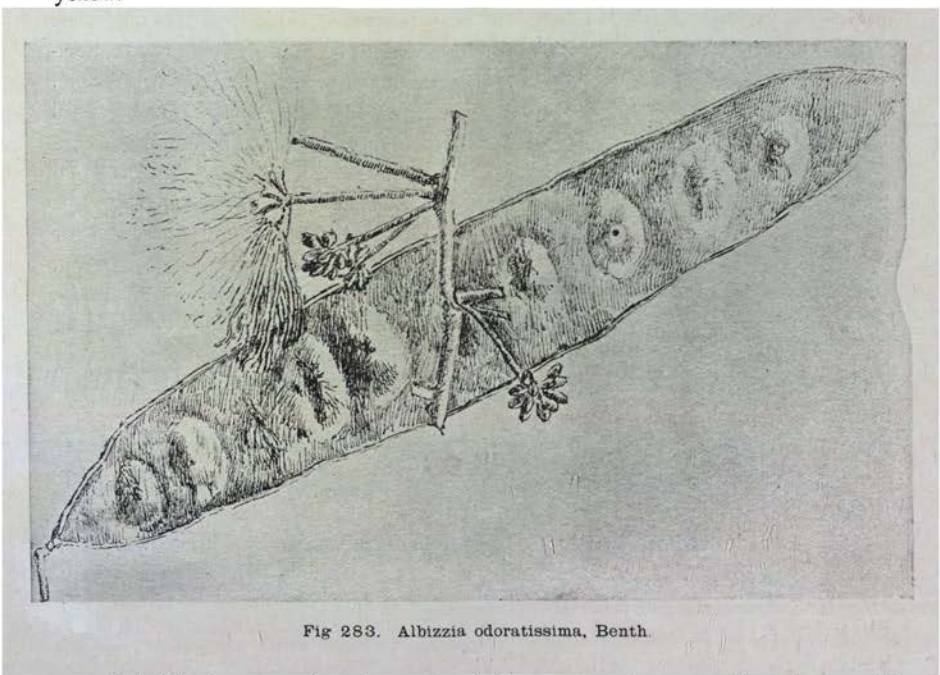


Fig 283. Albizzia odoratissima, Benth.

Sub-Himalayan region from the Indus eastwards, ascending to 3000′; Burmah, Assam, Central and Southern India, low country of Ceylon; common in the moist monsoon-forests of North Kanara and the Konkan also in the dry Deccan, ascending to 3700′ in the Khandesh Akrani. Fl. Apl.-June. Fr. C. S. A large, deciduous tree. Bark ·5″ thick, rough, grey, with irregular cracks; inner-bark purple, fibrous. Wood: sapwood large, white; heartwood dark-brown very hard. Pores containing a dark gum, large, single or double, surrounded with a very narrow ring of white tissue. Medullary rays fine, rather distant; wood silver-grained; weighs about 50 lbs. to the cub. ft. Yields a fairly durable timber which is in considerable request in North Kanara for oil-mills, wheels and furniture. The leaves and twigs are lopped for cattle-fodder. A dark-brown gum, insoluble in water, exudes from wounds in the bark.

3. A. procera, Benth. in Hook. Jour. Bot. (1844) 89; Fl. Br. I. 2, 229; Bedd. Fl. Sylv. 98; Cooke Fl. Pres. Bomb. 1. 453; Gamble Ind. Timb. 305; *Acacia procera,* Willd.; Dalz. & Gibs. Bomb. Fl. 87; Brandis For. Fl. 175. *White Siris. Bellati, billi-baage,* K.; *Kinhai,* M.; *Karalla, kilai, tihiri, gurar,* Vern.

A large, deciduous, smooth, white-barked tree. Leaves abruptly bipinnate; rachis 12″-18″ long, glabrous with a large sessile gland about the middle of the petiole; pinnæ 2-6 pairs, 5″-6″ long; rachis channelled with a gland between the uppermost pair of leaflets; leaflets 4-10 pairs, obliquely oblong-ovate, 1″-1·5″ by ·7″-·8″, subcoriaceous, glabrescent, dark-green above, pale and more or less pubescent beneath, obtuse or sometimes emarginate and very shortly apiculate at the apex; midrib near the lower margin; petiolules ·05″ long, pubescent. Flowers sessile, white, in many-flowered heads, ·75″ in diameter; peduncles slender, 3-5-fascicled, arranged in large, terminal or axillary, leafy panicles; peduncles ·25″-·5″ long, slender. Calyx ·1″ long, glabrous; teeth triangular. Corolla pubescent, twice as long as the calyx; lobes ovate, as long as the corolla-tube. Stamens with greenish-yellow filaments ·5″ long, connate at the base into a short tube. Pods very shortly stalked, thin, strap-shaped, 4″-8″ by ·5″·75″, dark-brown, faintly reticulate above the seeds; seeds 6-14, ovoid, flattened, ·3″ long, pale-brown.

Central and Eastern Himalayas, Burmah, Western peninsula, and the Malay Archipelago; throughout the presidency, common in the North Kanara and Konkan moist monsoon-forests. In the dry districts along ravines and nalas. Fl. May. Fr. Jan.-Feb. A large tree of rapid growth with yellowish-white, nearly smooth bark. Sapwood large, yellowish-white; heartwood hard, dark-brown, shining, with alternate bands of darker and lighter-coloured tissue. Pores equally distributed, of different sizes, large and medium, single or in groups of 2 each, surrounded by a ring of soft tissue. Medullary rays fine, numerous. Weighs about 45 lbs. to the cub. ft. The timber is converted into sugar-cane mills, agricultural implements, wheels, scantling for bridges etc.; much used in North Kanara for houseposts. The wood is an excellent fuel and makes good charcoal.

4. A. stipulata, Boiv.; Benth. in Hook. Jour. Bot. (1844) 92; Fl. Br. I. 2, 300; Brandis For. Fl. 178; Bedd. Fl. Sylv. t. 55; Dalz. & Gibs. Bomb. Fl. 88; Cooke Fl. Pres. Bomb. 1, 452; Gamble Ind. Timb. 306. *Bagana, kalbage,* K.; *Laeli, udul, kasir,* M.; *Phalari,* Thana; *Shambar,* Panch Mahals.

A large, deciduous, fast-growing tree; young parts covered with golden-yellowish pubescence. Leaves large, abruptly bipinnate; stipules large, very caducous, membranous, light-brown pubescent; unequally cordate at the base; terminating at the apex in a filiform tail; rachis 6″-15″ long, pubescent, with a large sessile gland about the middle of the petiole and smaller glands between the uppermost 2-9 pairs of pinnæ; pinnæ 7-20 pairs, 3″-5″ long; rachis slender,

pubescent, channelled; leaflets 30-40 pairs, subsessile, ·25″-·3″ by ·1″, linear-falcate, subacute at the apex, truncate at the base, membranous, pale green, glabrous and minutely longitudinally veined above, glaucous and ciliate on the margins and midrib beneath; midrib very close to the upper margin. Flowers yellowish, inodorous, in peduncled heads, about 1″ long to the ends of the stamens; peduncles divaricate, pubescent, 1-4 together, ·75″-1·25″ long, arranged in small, axillary or terminal panicles; pedicels very short or 0; bracts ovate, acuminate, membranous, ·5″ long, very caducous. Calyx tubular, puberulous, ·1, long; teeth acute. Corolla twice as long as the calyx with acute, reflexed lobes, densely pubescent outside. Stamens slightly tinged with red, 4-times as long as the corolla, connate into a tube at the base. Pods 6″-8″ by 1·25″, very shortly stalked, narrowed at both the ends, thin, glabrous; pale-brown, 8-12-seeded, not or very faintly reticulately-veined opposite the seeds; seeds ovoid, ·25″ long, compressed, dark-brown.

Tropical Himalayas ascending to 5000′ in Sikkim, Ceylon and Burmah; common in the rain-forests of the Konkan and North Kanara ghàts. Fl. Apl.-June. Fr. C. S. A large, deciduous, fast-growing tree. Bark grey, rough. Wood; sapwood large, white; heartwood brown, soft, shining, not durable. Weighs about 35 lbs. to the cub. ft. Used as a shade-tree in the Assam tea plantations, also for shade to coffee bushes in Southern India. The amount of nitrogen in the soil is increased by the presence of symbiotic bacteria on the roots of this species of *Albizzia*.

5. A. amara, Boiv., Benth. in Hook. Jour. Bot. (1844) 90; Fl. Br. I. 2, 301; Brandis For. Fl. 178; Bedd. Fl. Sylv. t. 61; Dalz. & Gibs. Bomb. Fl. 88; Cooke Fl. Pres. Bomb. 1, 454; Gamble Ind. Timb. 307. *Tugli*, K.; *Lallei*, Vern.

A small or middle-sized deciduous tree; branchlets etc. covered with soft, grey pubescence. Leaves abruptly bipinnate; rachis 2″-4″ long, yellow-tomentose, with a small gland about the middle of the petiole and another between the uppermost pair of pinnæ; stipules minute; pinnæ 6-15 pairs; rachis 1″-2″ long, channelled and yellow-pubescent; leaflets 10-30 pairs, closely arranged and sometimes slightly overlapping, small, ·25″-·3″ by ·05″-·1″, sessile, linear, obtuse or subacute, pubescent, pale-green, glabrous above, glaucous beneath, the midrib nearly in the centre. Flowers fragrant, subsessile, in 12-20-flowered heads, 1″-1·5″ in diameter; peduncles solitary or 2-3 together in the axils of the young leaves, not panicled, ·5″-1″ long, grey or yellowish-tomentose. Calyx ·1″ long, funnel-shaped, tomentose. Corolla yellow, tomentose, twice as long as the calyx; lobes ovate, acute and reflexed at the apex. Stamens ·5″-·6″ long; filaments tinged with pink. Pods 5″-8″ by 1″, stalked, thin, flat, puberulous, veined, margins raised, undulate; seeds 6-8.

Southern and Western India, Mysore, Carnatic and dry regions of Ceylon;

throughout the presidency in dry monsoon or thorn-forests. Fl. Apl.-June. Fr. cold season. A moderate-sized, deciduous tree. Bark dark-coloured, smooth, thin, scaly. Green-cell layer close to surface. Sapwood large; heartwood purplish-brown, mottled, extremely hard, with alternate, concentric light and dark bands. Pores moderate-sized, scanty, in patches of soft tissue, forming short, concentric bands. Medullary rays fine, numerous. Weighs about 60 lbs. to the cub. ft. Used for carts, house-building, ploughs, etc. also for fuel. The leaves are sometimes employed for washing the hair.

49. PITHECOLOBIUM, MART.

Trees unarmed or spinescent; with or without stipules. Leaves bipinnate. Flowers in globose heads or cylindrical spikes, pentamerous, bisexual. Calyx campanulate or tubular, with short teeth. Corolla-segments connate from below for ½ their length, valvate. Stamens indefinite, much exserted. Ovary sessile or stalked; ovules numerous; style filiform; stigma minute. Pod flat, circinate or falcate, 2-valved; usually dehiscent and much twisted when perfectly ripe; seeds in a scanty pulp; funicle filiform or expanded into an arillus.

P. bigeminum, Benth, in Hook. Lond. Jour. Bot. (1844i) 3, 206; Dalz. & Gibs. Bomb. Fl. 89; Fl. Br. I. 2, 303; Bedd. Fl. Sylv. 96; Cooke Fl. Pres. Bomb. 1, 455; Gamble Ind. Timb. 309. *Kan-karinje, nuggikar,* K.; *Kachlora,* Vern.

A medium-sized, evergreen tree; young parts rusty-puberulous. Leaves bipinnate, rachis 1·5″-3″ long, glabrous with a sessile gland at the base and another below the lowest pair of pinnæ; pinnæ 1-2 pairs; rachis 2·5″-4″ long, channelled, glandular between each pair of leaflets and with a subulate prolongation at the apex, puberulous; the lower pair of pinnæ much smaller than the upper; leaflets 1-4 pairs, 3″-6″ by 1″-2·5″, (the terminal pair the largest), ovate or elliptic-lanceolate caudate-acuminate, acute and somewhat unequal-sided at the base, subcoriaceous, pubescent at first, at length glabrous on both sides; petiolules ·1″ long. Flowers sessile, in 2-6-flowered, pedunculate clusters, arranged in large axillary and terminal panicles shorter than the leaves. Calyx ·1″ long, tubular, acute. Corolla yellowish-white, 2-3 times as long as the calyx; lobes lanceolate, acute, as long as the tube, pubescent at the apex. Stamens ·3″-·5″ long. Pods flat, 3″-5″ by ·75″, curved into one or two spirals, undulate along the upper suture, less so long the lower, acutely or bluntly pointed at the apex, narrowed at the base into a stout stalk ·5″ long, rough and tomentose without, bright-red within, 5-8-seeded; seeds suborbicular, compressed, ·5″ in diameter, black, hanging from the open fruits by long, slender funicles.

Eastern Himalayas, ascending in Sikkim to 4000′, Assam, Cachar, Western peninsula and Ceylon. Common in the rain-forests of the Konkan and

Fig 284. Pithecolobium bigeminum, Benth.

North Kanara. Fl. C. S. Fr. ripe June-July. A large or middle-sized, evergreen tree with smooth, grey bark. Wood soft, light, reddish-brown; heartwood darker coloured. Pores medium-sized, often sub-divided, equally distributed, not enclosed in rings of white or pale tissue. Medullary rays extremely fine, closely packed, inconspicuous. Weighs 31 lbs. to the cub. ft. Wood not used in N. Kanara. The circinate flat dehiscent open pods with black, pendant seeds have a peculiarly fœtid odour during the rainy season in the N. Kanara rain-forests. Erroneously called *Iron wood* in my Bombay Trees, Shrubs etc. (1902).

P. dulce, Benth. in Hook. Lond. Jour. Bot. (1844) 199; Fl. Br. I. 2, 302; Bedd. Fl. Sylv. t. 188. *Manilla Tamarind. Vilayti-amli,* Hind. A cultivated species, introduced from Mexico. Fl. R. S. Fr. C. S. Bark smooth, lenticellate, with horizontal, raised ridges often crowned with woody prickles. Largely grown for

fuel in Southern India, also cultivated as a hedge plant. The white pulp which surrounds the seeds is sweet and edible.

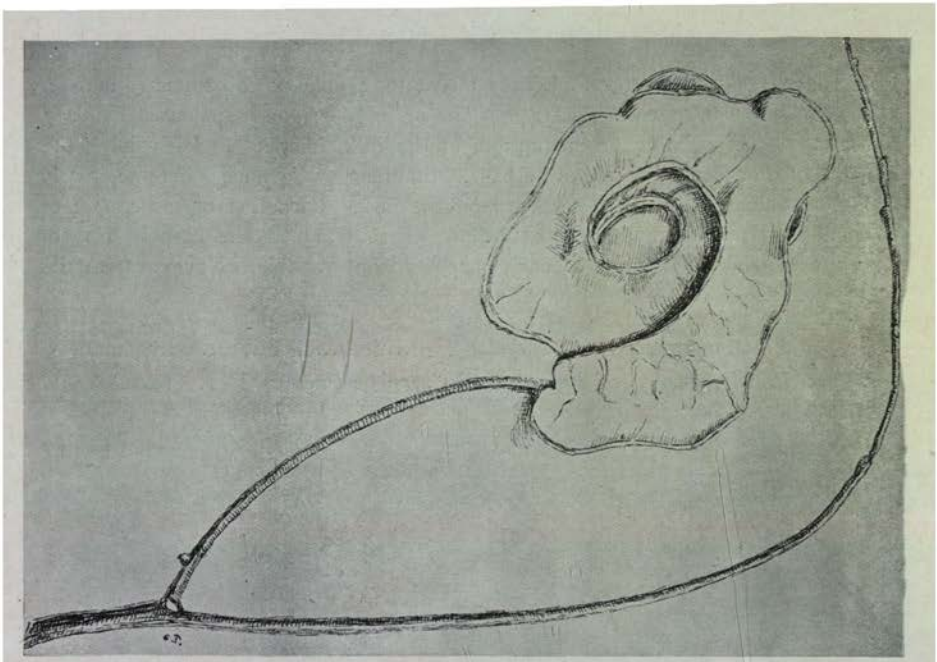


Fig 285. Pithecolobium bigeminum, Benth.—*(Fruit).*

P. Saman, L.; *Uango* or *Rain Tree.* Introduced into North Kanara. Fl. C. S. Fr. R. S. A large tree of very quick growth with a soft, useless timber. Planted along roadsides in the Belgaum District and near Belgaum town itself.

Order XXXIX—ROSACEÆ.

Herbs, shrubs or trees. Leaves alternate, simple or compound, stipulate. Flowers bisexual, regular. Calyx superior or inferior, gamosepalous. Petals 5 (rarely 0), inserted under the margin of the disk, imbricate. Disk lining the calyx-tube or forming a ring at its base. Stamens perigynous, indefinite, rarely 1-5 or 10, inserted with the petals or on the disk. Carpels 1 or more, free or connate or adnate to the calyx-tube; styles as many as the carpels, free or connate; ovules 1 or more in each carpel. Fruit variable, of achenes, berries or drupes.

Erect, unarmed tree. Carpel 1	...	...	...	1. Pygeum.
Prickly, usually trailing shrubs. Carpels numerous...				2. Rubus.

Fig 286. Pygeum Gardneri, Hook f.

1. PYGEUM, GÆRTN.

Evergreen trees or shrubs. Leaves simple, alternate; basal-glands 2 or 0; stipules minute, deciduous. Flowers small, bracteolate, racemose or paniculate. Calyx-tube obconic, urceolate. Petals minute, 5-6 or 0, villous or tomentose. Stamens 12-20 or more. Ovary 1-celled; ovules 2, collateral, pendulous; style terminal; stigma capitate. Fruit a transversely oblong, 2-lobed drupe; cotyledons very thick, hemispheric; radicle minute, superior. *Pygeum* differs from *Prunus* chiefly by the fruit and flowers with small villous petals.

P. Gardneri, Hook. f.; Fl. Br. I. 2, 321; Cooke Fl. Pres. Bomb. 1, 458; *P. acuminatum,* Grah. Cat. 247 (not of Coleb.); *P. zeylanicum,* Dalz. & Gibs. Bomb. Fl. 89, exclud. syn. (not of Gærtn.) *Sugnigari,* K. *Daka,* M.

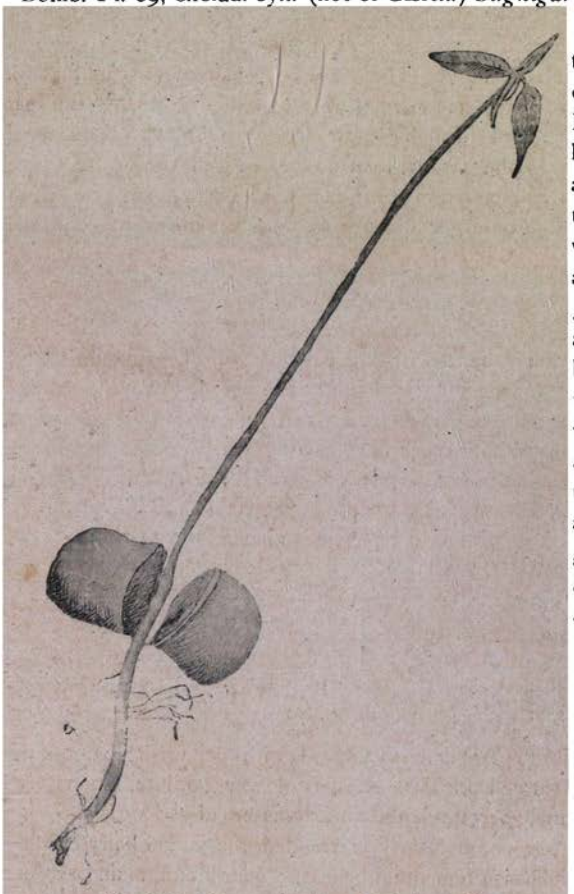


Fig 287. Pygeum Gardneri, Hook. f.—*Seedling.*

A small or moderate-sized tree; branches grey, smooth, covered with large lenticels. Leaves elliptic or oblong-lanceolate, obtuse or long-acuminate, unequal-sided at the base, 4″-6″ by 1·25″-2·25″, very coriaceous, dark-green above, paler beneath; nerves 5-6 pairs, arching upwards and prominent beneath; the large glands at the base of the blade are sometimes wanting in the Konkan but are nearly always present in the N. Kanara tree; petioles about ·5″ long, rugose, glabrous. Flowers white, about 20, closely set in axillary racemes 3″-4″ long; pedicels stout, pubescent, ·12″-·25″ long. Calyx turbinate or obconic; tube ·25″ across at the top, densely fulvous-tomentose outside, red-coloured within; lobes 5, obtuse, densely villous. Petals 5, alternate with the calyx-lobes and somewhat

larger and more villous. Stamens about 20 in 2 or 3 series, inserted on the disk at the mouth of the calyx; filaments about twice as long as the calyx-tube, much exserted, incurved in bud. Ovary free, quite glabrous, seated on a ring of hairs; style exserted in bud; stigma capitate. Fruit broader than long, ·75″-1·25″ across, transversely-oblong, bilobed, smooth, glabrous, apiculate in the sinus at the top; the endocarp smells strongly of prussic acid.

Western peninsula along the ghâts from the latitude of Bombay to the Nilghiris; common on the Mahableshwar plateau on laterite and sparsely distributed along the Belgaum and N. Kanara ghâts in rain-forest.

Usually a small or medium-sized tree with brown, thin, rough bark. Wood moderately hard, very light-pink, smooth, compact. Annual-rings indistinct. Pores small, single or divided, sparsely distributed, or in radial or oblique lines of 3-5 together. Medullary rays fine and moderately broad, numerous. Weighs 50 lbs. to the cub. ft. (Mahableshwar wood) Fl. end of Oct. Nov. Fruit C. & H. seasons. There is apparently only one species within the limits of the Bombay presidency and the Kanara and Mahableshwar trees which were considered distinct in my Trees etc. of Bombay are without doubt one and the same. The difference between the calyx-lobes and the petals is clearly seen in fresh specimens; the latter are slightly larger and are also more pubescent than the former.

2. RUBUS, Linn.

Prickly suberect or trailing shrubs or creeping herbs. Leaves alternate, simple or compound; stipules more or less adnate to the petiole. Flowers white or red, usually in terminal or axillary panicles. Calyx free, cleft into 5 persistent lobes. Petals 5. Stamens numerous. Disk coating the broad calyx-tube. Carpels many, on a convex receptacle; ovules 2, collateral, pendulous. Drupes many, 1-seeded, crowded on a conical, dry or spongy, receptacle.

Leaves simple, palmately-lobed ...	... 1. R. moluccanus.
Leaves trifoliate	... 2. R. ellipticus.
Leaves 5-9-foliate	... 3. R. lasiocarpus.

1. R. moluccanus, Linn.; DC. Prodr. 2, 566; Fl. Br. I. 2, 330; *R. rugosus,* Smith; Wight Ic. t. 225; Dalz. & Gibs. Bomb. Fl. 89

A large, straggling shrub; branchlets covered with yellowish tomentum, armed with scattered short curved prickles. Leaves deeply cordate, palmately 5-7-lobed, irregularly and finely serrate-dentate nearly as broad as long, 3″-6″ in diameter; upper-side bright-green, more or less wrinkled, rough and hairy on the nerves, clothed with soft, yellowish tomentum beneath; midrib and main nerves

pubescent and prickly; petioles 2″-3″ long, densely fulvous-hairy and prickly; stipules usually large, laciniate or pinnatifid, densely hairy. Flowers white, in dense axillary racemes or clusters shorter than the leaves, clothed with silky buff-coloured tomentum, variable in size; peduncles stout; pedicels short; bracts pectinate. Calyx cup-shaped, ·5″ across, usually deeply triangular-lobed, densely silky-hairy outside. Petals white, obovate, shorter than the calyx. Fruit bright-red, globose and succulent, slightly acid to the taste.

Central and Eastern tropical and temperate Himalaya, ascending to 7000′, Eastern and Western peninsulas; Ceylon in the moist country at all elevations above 1000′.

Along the higher ghâts from Mahableshwar southwards also on the Nilkund and Southern ghàts of North Kanara at about 2000′ elevation. Fl. and Fr. C. & R. S.

2. R. ellipticus, Smith in Rees' Cyclop. XXX, Rubus 16; Fl. Br. I, 2, 336; Cooke Fl. Pres. Bomb. 1, 459; Brandis Ind. Trees, 286; Gamble Ind. Timb. 317; *R. flavus,* Brandis For. Fl. 197; *R. Wallichianus,* Dalz. & Gibs. Bomb. Fl. 89.

A large shrub with long, trailing, angular branches, densely clothed with shaggy, spreading, bristly, brown hairs, covering a short, grey pubescence; branches, rachis of inflorescence, petioles, midrib on underside of leaflets etc. armed with scattered, short, hooked prickles. Leaves pinnately trifoliate; rachis including the petiole 1·5″-2·5″ long, shaggy with spreading, brown hairs; petioles 1·5″-1″ long; stipules subulate; leaflets broadly elliptic or obovate, obtuse or shortly acuminate, irregularly and finely serrate-dentate, coriaceous, green, nearly glabrous above, covered with dense grey pubescence beneath; terminal-leaflet 2·5″-3·5″ by 2″-3″; lateral-leaflets about half as large; nerves 8-12 pairs prominent beneath. Flowers in axillary and terminal panicles, shorter or longer than the leaves; pedicels ·25″ long. Calyx deeply 5-lobed, densely tomentose outside, ·5″ in diameter; lobes ovate, mucronate. Petals white, obovate, longer than the calyx-lobes. Stamens 1-seriate. Fruit golden-yellow, edible.

Temperate and sub-tropical Himalaya, Khasia mountains, Burmah, Western peninsula, Nilghiris, Bababudans, Pulneys etc. and Ceylon. From Mahableshwar southwards along the highest ghâts at 4-5000′ elevation. I have not found either this or the next species in N. Kanara. Fl. Mch. May.

3. R. lasiocarpus, Smith Fl. Br. I. 2, 339; Dalz. & Gibs. Bomb. Fl. 89; Cooke Fl. Pres. Bomb. 1, 460; Gamble Ind. Timb. 317; Brandis Ind. Trees, 286. *Gawriphul,* M.

A spreading sarmentose, prickly shrub with long, glabrous, purple, pruinose stems, often overhanging and rooting at the extremities; branchlets without bristles or glandular hairs covered with a thin, grey tomentum; prickles conical, slightly hooked at the tip, brown, shining, glabrous. Leaves 4″-8″ long; rachis

soft, woolly-pubescent, usually very prickly; leaflets 5-9, ovate-lanceolate, acute with large serratures, the terminal leaflet often lobed, dark-green, wrinkled and glabrescent on the upper side, white-tomentose beneath; nerves numerous, parallel, prominent beneath, impressed on the upper surface; stipules linear, acute. Flowers in lax, terminal and axillary, grey-tomentose corymbs shorter than the leaves; bracts linear, subulate. Calyx pubescent; tube short and broad, divided nearly to the base into 5 ovate, long-acuminate lobes. Petals pink, shorter than the calyx-lobes. Carpels numerous, tomentose. Fruit ·5″-·75″ in diameter, black when ripe, edible.

Temperate Himalaya, from Murree and Kashmir, 5-8000′ elevation to Sikkim, 4-10000′, Burmah, Western peninsula, Nilghiris etc. Ceylon, Java; common on the Mahableshwar plateau in moist evergreen monsoon-forest also cultivated in gardens below the lake and known locally as the *"Mahableshwar Raspberry."* Fl. Nov. Fl. and Fr. R. S.

Fig 288. Rubus lasiocarpus, Smith.

INDEX.

NATIVE AND ENGLISH NAMES.

A

	PAGE		PAGE
Abi	177	Aran	275
Adwi-bhendy ...	168	Arang	151
Adwi-nimbe ...	201	Aratala	337
Agasta	388	Ardal	337
Akshath	458	Ardanda	62
Alan	275	Arkur	476
Alei	429	Armadal	187
Alexandrian Laurel	99	Armadalu	187
Amate	362	Armarlu	187
Amba	348	Arnelly	217
Ambada	362	Arnotto	72
Ambat-bel	317	Arsambal	404
Ambatti	360	Arsina gurgi	93
Amberi	360	Arsul	450
Ambut	362	Asan	431
American Sumach Tree ...	443	Ashok	458
Amli 459,	463	Ashoka	458
Amoni	347	Asoka	22
Amrutbali	36	Asolin	168
Anjan	456	Asreli	86
Anjar	485	Asupala	22
Antal	337	Atmatti	466
Antbarlu	393	Attak	76
Apta	462		

B

Babbar	480	Balagi	217
Babul	480	Balal	204
Badi-gumchi	470	Bal-nimb	228
Baelputri	206	Balpale	273
Bael-tree	206	Balwuli	359
Bagana	499	Banate	273
Bahawa	448	Banne	462
Bakam limbodo	226	Banni-mara	487
Baka-yan	228	Baobab	129
Bakayun	226	Basingi	61

B

	PAGE		PAGE
Bastard Cedar ...	226, 245	Bili-devdari	233
Bastard Poon Tree ...	.. 136	Bili-jali	485
Bastard Red Cedar	... 177	Bilimbi	183
Bastard Sandalwood Tree	... 177	Bilkumbi	497
Bastard Teak ...	... 409	Billi-baage... ...	499
Bayisa-gugul ...	... 220	Billu	250
Bead Tree ...	... 226	Billu-bhendy ...	... 127
Bel	... 204	Bilur	... 275
Belada	... 204	Bipte	... 359
Bellada	... 485	Biti	... 423
Bellaka	... 127	Bitusi	... 64
Bellati	... 499	Black Dammer Tree	... 221
Belli-pata	... 121	Black oil	... 276
Beltivas	... 411	Blackwood Tree ...	... 423
Bendri-bender-wel ...	... 320	Bobbi	... 101
Bengal Kino ...	... 409	Bodbakka	... 262
Bengal Quince ...	... 206	Boddingin gidda ...	... 253
Ber	... 294	Bokhi	... 178
Batta davare ...	... 452	Bombay Hemp ...	... 379
Bhably	... 76	Boogri	... 82
Bhalwan	... 278	Bor	... 294
Bharatti	... 281	Bother	... 151
Bharikoi	... 140	Bothi	127, 151
Bhekal	... 76	Botku	... 151
Bhendy	125, 127	Boya	... 448
Bhes	... 486	Brindon	... 90
Bhirand	... 90	Budjaridhamun ...	... 151
Bhoikohola ...	... 406	Bukunta	... 226
Bhorkhakai ...	... 76	Bulauri	... 70
Bhutali	173, 190	Bullock's heart ...	... 28
Bia	... 431	Bundurgi	... 343
Biba	... 355	Buramb	... 239
Bibha	... 355	Burkas	... 275
Bibla	... 431	Burla	... 130
Bidsale	... 340	Buswanpad ...	... 464
Bihul	... 159	Butale	... 160
Bijapara	... 203	Butapala	... 275
Bijasal	... 431	Bute	... 151
Bijori	... 203	Butea Gum ...	... 464
Bili-budlige ...	... 233	Byala	... 204

C

Camel-thorn ...	... 389	Catechu	... 488
Caper Plant ...	... 52	Catechu-Nigrum ...	... 488
Cashewnut ...	... 350	Cawtha	... 204
Cassie Flower ...	... 479	Ceylon Oak ...	... 335

C

	PAGE		PAGE
Chably	278	Chikti	393
Chakro	139	Chilar	492
Chalajuti	193	Chillur	441
Challane	108	Chimat	302
Chalta	10	Chimnati	382
Chambil	465	China limbu	198
Chambuli	465	Chinch	459
Champa	13	Chinese Blackwood	426
Champari	76	Chinna bally	155
Champer	76	Chira	168
Champo	13	Chittagong Wood Tree ...	248
Chandmara	145	Chor	168
Changbali	171	Choura	168
Char	349	Citron	203
Charoli	349	Cocculus Indicus of Pharmacy..	37
Chaudhari	308	Cochli	188
Chauri	138	Commiphora Mukul	219
Chayruka	54	Cowitch	399
Chichola	496	Custard Apple	26
Chickla	497	Curry Leaf Tree	194
Chiken	164	Cutch Tree	488

D

Dadsal	160	Dhamin phalsa	162
Daka	505	Dharambe ...	91, 94
Dandoshy	428	Dhawri	317
Dandous	428	Dhupada	113
Dari	406	Dinda	326
Daushir	282	Dino	327
Davangi	94	Dividivi	443
Deavkai	94	Dodda-ganpi	470
Dev-babul ...	479, 486	Doddagli maddu	242
Devdari	249	Donnmullina	486
Devdaru	231	Dowpowla	420
Dewa-kunchun	466	Draksha	316
Dhal	414	Drek	226
Dhaman	165	Drum-stick Tree	364
Dhamana	160	Drunnu	377
Dhamani	160	Dutle	278

E

East Indian Screw Tree ...	146	Edible-stemmed Vine ...	308
East Indian Walnut Tree ...	497	Elephant Apple	204

F

False Sandalwood	256	Fever Nut	439

G

	PAGE		PAGE
Gaer	470	Goldar	139
Gaja	439	Goldaru	136
Gajkai	439	Gonik chentz	129
Gamboge Tree	93	Goolmohr Tree	444
Gandla	194	Gorchi	298
Ganeri	70	Gorpad-wel	323
Gangr	296	Goruk amla	129
Gansargi	94	Goru-mavu	350
Gapsandi	82	Gorwi	298
Gapsandi-bally	292	Gowindi	62
Garambi	470	Grape Vine	316
Garbe	470	Gudda	76
Gardul	470	Gugal	219, 221
Gardundy	97	Guggul dhup	209
Garud phul	37	Gugul	353
Gauri	23	Gukikar	479
Gawlin	278	Gulaveli	36
Gawri phul...	507	Gulbel	36
Gaz	85	Gulgollop	164
Gendgisa	257	Gulgul	70
Gengri	428	Gulgunji	397
Ger	355	Guli	298, 304, 381
Gero	355	Gulo	36
Ghagri	377	Gulvel	36
Ghorwel	320	Gulwail	36
Ghot-ber	298	Gunchi	397
Ghugharo	377	Gundira	242
Ginal	309	Gunglay	70
Gingo	158	Gungo	158
Girmala	448	Gunji	397
Giroli	36	Gur	267
Godachi	298	Gurar	499
Godambe	350	Gurguri	164
Godhunchi	497	Gurmoot	172
Godi serni	87	Gutchka	439

H

Hadergitte...	475	Halda	250
Hadga	388	Haldi	95
Hadsangi	224	Hamra	472
Hadwurna	64	Hansampige	76
Haiga	111	Hanumanth	76
Hajeru	476	Happu savaga	139
Halabalagi...	217	Hardala	93
Haladi	168	Haribaval	485
Haladwail	178	Harjora	308

H

	PAGE
Har-kinjal	33
Harmal	317
Harrani	428
Harreri	496, 497
Hasagum-gidda	399
Hasgurgia	429
Hedare	267
Helbeva	209
Hewar	485
Hejuli-badam	350
Hill Mango	345
Hinganbet	210
Hingu	210
Hiral bogi	111
Hiressa	308
Hod-jali	486
Hog plum	362
Hole lakki	64
Holigar	357
Hona	99
Hond	431
Honge	432
Honne	431
Hoolgeri	357
Hooliganji	446
Hoom	24, 31
Horse Radish Tree	364
Hotsige	441
Huleshadla-balli ...	367, 368
Huli gowri	119
Hunase	459
Hunmunki	76
Hurmacha	281
Hursankar	308
Huruk	249
Husrani	429
Huttige-balli	316

I

Ilanji	294
Iliya	127
Indian Copal Tree	113
Indian Coral Tree	400
Indian Fir	22
Indian Gum Arabic Tree ...	480
Indian Hemp	379
Indian Laburnum	448
Indian Liquorice Root ...	397
Indian Mahogany	249
Indian Red Wood	245
Indian Travellers' Joy ...	4
Indian Wild-Vine	316
Indigo Plant	381
Irai	101
Iron Wood of Pegu and Arracan	468

J

Jakhmi	343
Jali	480
Jalli	479
Jamba	468
Jambe	468
Janagi	94
Jangra	296
Jao	87
Jassundie	458
Jau	85
Javasa	389
Jawassi	389
Jerusalem Thorn	446
Jhallanda	110
Jhall mara	110
Jhaw	84
Jijani	158
Jil	381
Jini	327
Juggum	76
Julpai	172
Jummina	188
Jungle-badam	136
Jungly-ganga	394
Jungly kalimirchi	189

K

	PAGE		PAGE
Kabale	185	Kanguni	276
Kabasale	79	Kanju	76
Kabbali	429	Kankanchi-bally	199
Kachki	439	Kankaringe	501
Kachlora	501	Kankri	479
Kada	137	Kankuti	418
Kaderi	488	Kan limbu	201
Kadu-kajar	226	Kan nimbe	199
Kadukhajur	228	Kanka gotti	298
Kai-bevu	228	Kantalki-mara	337
Kaiger	490	Kantel	79
Kajolitsayel	324	Kanthar	61
Kaju	351	Kanwail	290
Kakad	217	Kaori	164
Kakaphula	37	Karachi	456
Kaker	76	Karai	137
Kakkai	448	Karalla	499
Kakmari	37	Karambel	10
Kaku-mulla	440	Karanj	432
Kala-gaura	267	Karbat	439
Kala-phulas	390	Kardor	116
Kalaruk	423	Karhepah	194
Kalauri	137	Karhinimb	194
Kalbage	499	Karibevan	226
Kalgur	267	Kariganne	276
Kalhoni	111	Karikawdi	165
Kalikikar	480	Karin-tagera	426
Kalitaka	50	Karmal	10
Kalo-sarasio	497	Karm-kara	149
Kalvari	52	Karnikar	149
Kamaranga	182	Karu-nili	381
Kamra	456	Karwan	64
Kamtiya	487	Karwi-nai	406
Kanaga	432	Kas	389
Kanagola	10	Kasabally	334
Kanak-champa	149	Kasir	499
Kanakindali	339	Kassod	454
Kanaraj	466	Kassoo	172
Kanchan ... ... 464.	466	Kastel	79
Kanchana	466	Kati	397
Kandawel	308	Katila gum	138
Kandi	472	Katori	204
Kandol	137	Katsavar	133
Kaner-balli	296	Kauntel	59
Kangkur	217	Kavargi	146
Kangli	276	Kavat	204
Kanguna-bally	285	Kavsi	111

K

	PAGE		PAGE
Kawatha	204	Kole-zan	314
Kawti	79	Kondagu-mara	309
Kazurati	285	Kookur	139
Kempu-kowri	146	Koon	335
Kenchigibally	442	Koorangal	432
Kenchna	466	Kora	242
Ker	57	Kovidara	466
Kera	57	Kovit	204
Kesali	150	Kowri	165
Kevani	146	Kowsey	140
Khair	488	Kua-mhad	136
Khajgoli-ka-vel	317	Kud	137
Khajulgi	320	Kudak	217
Khandergai	217	Kud Champa	13
Khanshi	140	Kudia-nim	194
Kharmati	163	Kudre sulte	79
Khar phulsa	165	Kuhila	399
Khas	172	Kuhumb	335
Khat	317	Kuldgajga	446
Khatumdre	317	Kumbanga	171
Khavas	140	Kumla	64
Khor	490	Kunti	193
Kikar	480	Kurak	217
Kilai	499	Kurda	137
Kinhai	499	Kurdul	116
Kiral	57	Kuriaput	226
Kirkali	162	Kuri-bevu	194
Kirmira	191	Kurihouga	111
Kisri	72	Kurimutal	390
Kiti	79	Kuriya	242
Kivanch	399	Kuriyadi	292
Kodambada	362	Kurkunnie	327
Kodsa	267	Kurpa	332
Kohan	335	Kurpah	332
Kokani	370	Kursan	41
Koketi	139	Kurwa-wagutti	199
Kokum	90	Kurweil	10
Koland	315	Kusge	458
Kola sampige	13	Kusumb	335
Koleand	145	Kutkuta	370
Kolejan	316		

L

Laeli	499	Lakhandi	332
Lai	84	Lal-chundan	245
Lajalu	475	Lal-devadari	248

L

	PAGE		PAGE
Lal-jhau	86	Limbara	242
Lal-khair	488	Limri	189
Lallei	500	Litchi	340
Lao	85	Locundie	278, 290
Lei	84	Longan	339
Lemon	203	Looking-glass Tree	145
Lendphal	286	Lopez Root	189
Limacha-jhada	228	Lukthya	393
Limba	228	Lutchmi	343
Limbado	209		

M

Madrasada	239	Monkey Bread Tree ...	129
Mahabaleshwar Raspberry ...	508	Monia	353
Mahalunga	203	Mooltaga	332
Mahanim	249	Morbel	3
Mahanimb	209	Moriel	4
Maharuk	209	Mota karmal	10
Makai	296	Motha-tarvad	452
Malkangni	276	Mothi-kuhili	398
Malkanguni	281	Moti yekkadi	278
Manger	189	Moto-aduso	209
Mango Tree	348	Moulmein Cedar Tree ...	249
Manikyan	191	Muchucuda	148
Manilla Tamarind	502	Mudah	212
Marchulajuti	193	Muddhedhup	209
Mardiballi	429	Mudkarki	155
Margosa Tree	228	Muldi	426
Marking Nut Tree	355	Mullanim	226
Mashwal	250	Mullu kare	298
Mastondi	61	Mullu mutala	400
Mast Tree...	22	Munjuti	470
Mattigar	360	Muradsing	146
Mavina-mara	348	Murele-bhendy	334
Mediya-wel	323	Murgal	90
Menbundati	385	Murgauri	23
Mhua	365	Murmati	483
Midchi	327	Murrori-ka-jhar	146
Mitha Nimbu	203	Muttala	409
Mochi wood	400	Muttugal	409
Moee	353	Mysore thorn	441

N

Nagalkuda	136	Nagasampige	102
Nagari	100	Nagchampa	102

N

	PAGE		PAGE
Nagetta	106	Nil	381
Naibullal	198	Nila	343
Nalbila	227	Nili	381
Nallar	308	Nim	228
Nandan	314	Nimbarra	226
Nandena	315	Nimbu	203
Naram-panel	15	Nimuri	228
Narangi	203	Nir	381
Nardel	316	Nirvala	64
Narole	212	Nirsul-bondi	286
Negro Bean	398	Nuggikar	501
Nekri	256	Nuggi-mara	364
Netra	431	Nurche	327
Nikar	439	Nurkal	349

O

Odi	317	Oopin	150
Oleum Nigrum Plant ...	276	Oor-gero	355
Oopagi mara	91		

P

Pabba	248	Pargi balli	189
Pachawi	168	Parvel	41
Pachunda	55	Paryel	47
Padavali	45	Passi	429
Padrai	226	Patagonian Bean	404
Padri	429	Payal	349
Paharmul	45	Pegu-Catechu	488
Pahar-vel	45	Pejri	226
Paker	76	Pendguliyel	426
Pakur	46	Pepuli	188
Palara	245	Persian Lilac	226
Palas-vel	411	Persian Manna Plant ...	389
Panarvo	400	Phalari	499
Panarweo	400	Phansa	429
Pandhra-khair	490	Phatapate	97
Pandry	193	Phulas	409
Pangara	400, 402	Phullas kakria	409
Pangra	402	Phulsee	162
Panharya	485	Phulsun	407
Paorki	343	Physic nut	439
Papri	292	Pigavi	276
Paraji	296	Pigeon-pea	44
Parascha jhad	125	Piney Varnish Tree ...	113
Parascha pipla	125	Pitha	337

P

	PAGE		PAGE
Pithana	406	Pumelo	203
Pitori	280	Punay	97
Poon Spar Tree	100	Pundi	379
Poorwi	58	Pundi-bally	321
Poospala	194	Purgi	296
Portia Tree	125	Purging Cassia	448
Puchownda	59	Pynkado	468

R

Rae champo	13	Ran-Shegat	365
Ragi	443	Ran-toor	411
Ragta-kanchan	466	Ran-yeed	199
Rai dinda	327	Ratamba	90
Rain Tree	503	Ratobauli	484
Rainyi	245	Ravdi	55
Rakta rohida	300	Red Wood	470
Raldhup	221	Reni	245
Ramkanti	480	Rita	337
Ramphul	28	Rohan	245
Ramrick	40	Rosewood Tree of Southern India	423
Ran-bhendy ...	123, 124	Rudgamali	72
Ran-draksha	316	Rudrack	170
Ran-ghevda	415	Rudraksh	170
Ranjai	3	Rugt-rorar	300
Ran-limb	201		

S

Sabre Bean	404	Sarda	138
Sagada	335	Sarde	138
Sagargote	439	Sarpunku	385
Sageri	33	Sarub	87
Sakalyel	290	Satinwood	250
Salai	215	Saunder	472
Saldawar	137	Sauri	130
Salparni	394	Savandal	472
Salphullie	215	Savaya	138
Salsette Hemp	379	Sayar	130
Salwan daye	394	Segada	335
Samber	402	Segata	364
Sanaber	370	Semaphore Plant	396
Sandan	390	Semul	130
Sankasura	444	Sendri	72
Santaag	379	Sensitive Plant	475
Sappan Wood Tree ...	443	Serni	87
Sarata	87	Sessal	188

S

	PAGE
Shaddock	203
Shadloo	463
Shambar	499
Shameula	133
Shegla	364
Shema	472
Shembat	353
Shemberti	494
Shembi	494
Shemi	488
Shevgi	364
Shewarie	387
Shige	491
Shimti	353
Shingar-bally	304
Shiprigidda	57
Shirul	168
Shisham	423
Shishma	422
Shivga	364
Shri honay	100
Sigamkati	473
Sigekai	491
Silk Cotton Tree	130
Sind Gum Gugal	219
Sini	379
Siris	496, 497
Siris Tree	496
Sirpoon Tree	100
Sirsul	496
Sis	377
Sisali	423
Sisma	422
Sissai	377
Sissoo Tree	422
Sissu tali	422
Sisu	423
Sitaphul	26
Soapnut Tree of Southern India	337
Sonagaravi	398
Sonemau	190, 360
Sour lime	203
Sour Sop	29
Suami	245
Sudrabilo	357
Sugnigari	505
Sumri	472
Suna boorli	298
Suna Hemp	379
Sundar	370
Sundar chand	145
Supti	385
Suragi	97
Surangi	99
Surhoni	100
Suria	468
Surti	79
Surungi	97
Sweet Lime	203
Sweet Orange	203
Sweet Sop...	26

T

Tagsam	379
Talbe mara	142
Tamanysa	317
Tamarind	459
Tamarisk	84
Tambat	76, 78
Tambra Nagkesar	97
Tamruj	275
Tanach	422
Tangadi-gidda	450
Tanner's Cassia	450
Tarar	262
Tarati	62
Tarvad	450
Tattele	142
Tavir	95
Telitsayel	309
Telus	390
Tesaka-jhar	409
Tewas	390
Thorlagung	470
Thriphal	188
Tihiri	499
Tilabli	426
Timsa	390
Tirphal	188

T

	PAGE		PAGE
Tiruwa	468	Tugli	500
Tisul	188	Tulip tree	125
Titwi	334	Tumbutti	486
Todu	249	Tunaj	390
Tondarshi-jhad	281	Tundu	249
Tondsha	198	Tuni	249
Toon Tree	249	Turacha gidda	399
Toor	414	Tural	242
Torate	59	Turan	298
Toratti	79	Turruli	285
Totla-bally	62	Turwad	450
Totmudki	327		

U

Uango Tree	503	Ulpi	159
Udi	99	Undi	99
Udkhya	406	Undie	33
Udul	499	Unhali	385
Ulagera	360	Utimukta	178
Ullar-billar	42	Utrasum Bead Tree ...	170

V

Vabbina	24	Vedi-babul	480
Vagati	446	Vehkali	81
Val	470	Vehyenti	81
Varul	209	Vilayati-amli	502
Varvunna	64	Vilayati-babul	479
Vasandi	41	Vilayati-kikar	446
Vasanvel	41	Vilayati-nim	226
Vatoli	40	Virhoi	136
Vatyel	40	Vuma	99
Vayni	444	Vurtuli	473

W

Wag	62	White Silk Cotton Tree ...	133
Wagati	446	White Siris	499
Waghati	61	Wild Indigo	381
Wagutti	58	Wild Lime	201
Wagutty	62	Wild Liquorice	397
Waiwurna	64	Wild Mangosteen	90
Wakeri	446	Wood Apple	204
Walasura	241	Wood-oil Tree	108
Wallursi	241	Wood Olives	172
Wanu rajah	462	Wowali	172
Warung	127	Wumb	31
White Dammer Tree ...	113	Wundy	97

Y

	PAGE		PAGE
Yekkadi	81, 281	Yerul	 468
Yekyel	 426	Yesti	... 283
Yerindi	 231		

Z

Zamir 41

INDEX.

LATIN NAMES.

A

	PAGE
Abrus, Linn.	396
precatorius, Linn. ...	397
pulchellus, Wall.	398
Acacia, Willd.	478
arabica, Willd.	480
cæsia, W. & A.	493
Catechu, Willd.	488
concinna, DC.	491
eburnea, Willd.	483
Farnesiana, Willd. ...	479
ferruginea, DC.	490
Intsia, Willd.	492
Jacquemonti, Benth. ...	484
Latronum, Willd.	486
leucophlœa, Willd. ...	485
pennata, Willd.	494
pinnata, Dalz.	494
procera, Willd.	499
rupestris, Stocks	490
Senegal, Willd.	490
Suma, Kurz.	487
sundra, DC.	488
tomentosa, Willd. ...	485
Acronychia, Forst.	190
laurifolia, Bl.	190
pedunculata, Bedd. ...	190
Adansonia, L.	129
digitata, Linn.	129
Adenanthera, Linn.	470
pavonina, Linn.	470
Ægle, Corr.	205
Marmelos, Corr.	206
Æscidium esculentum, Barcl. ...	484
Agati grandiflora, Dalz. & Gibs.	388
Aglaia, Lour.	234
littoralis, Talb.	235
odoratissima, Blume. ...	234
Roxburghiana, Miq. ...	234
Ailantus, Desf.	208
excelsa, Roxb.	208
malabarica, DC.	209
Albizzia, Durazz.	494
amara. Boiv.	500
Lebbek, Benth.	496
odoratissima, Benth. ...	497
procera, Benth.	499
stipulata, Boiv.	499
Alhagi, Desv.	388
Camelorum, Fischer ...	389
Maurorum, Tournef. ...	389
Allophylus, Linn.	334
Cobbe, Bl.	334
Alsodeia, Thouars.	68
zeylanica, Thw.	68
Amoora, Roxb.	237
canarana, Benth.	238
cucculata, Roxb.	239
Lawii, Benth.	239
macrophylla, Nimmo ...	238
Rohituka, W. & A. ...	238
Ampelideæ	306
Ampelocissus Arnottiana, Planch.	316
latifolia, Planch.	315
tomentosa, Planch. ...	314
Anacardiaceæ	346
Anacardium, Rottl.	350
occidentale, Linn. ...	350
Anamirta, Coleb.	37
Cocculus, W. & A. ...	37
paniculata, Coleb. ...	37
Ancistrocladaceæ	115
Ancistrocladus, Wall. ...	116
Heyneanus, Wall. ...	116

A

	PAGE
Anona, L.	26
muricata, DC. ...	29
reticulata, Linn. ...	28
squamosa, Linn. ...	26
Anonaceæ ...	14
Apodytes, E. Meyer	264
Beddomei, Mast.	264
Benthamiana, Bedd.	264
Artabotrys, R. Brown	17
odoratissimus, R. Br.	18
zeylanicus, Hook, f. & T.	18
Aspidopterys, A. Juss.	179
canarensis, Dalz.	181
cordata, A. Juss.	181
Roxburghiana, A. Juss.	180
Atalantia, Corr. ...	200
ceylanica, Oliv. ...	201
floribunda, Wgt. ...	200
monophylla, Corr.	200
racemosa, W. & A.	201
Atragene zeylanica, Linn. ...	7
Atrategia Thomsoni, Bedd. ...	25
Atylosia, W. & A.	411
barbata, Baker.	413
crassa, Prain.	413
glandulosa, Dalz. ...	414
gœnsis, Dalz.	413
kulnensis, Dalz.	414
lineata, W. & A.	411
Lawii, Wgt.	411
mollis, Benth.	413
platycarpa, Benth. ...	412
rostrata, Baker	414
sericea, Benth.	412
Averrhoa, Linn.	182
Bilimbi, Linn.	183
Carambola, Linn. ...	182
Azadirachta, A. Juss. ...	228
indica, Adr. Juss.	228

B

Balanites, Delile	210
ægyptiaca, Del.	211
Roxburghii, Planch. ...	210
Balsamodendron, Kunth ...	218
Berryi, Arn.	220
gileadense, Don.	220
Mukul, Hook.	219
pubescens, Stocks ...	220
Roxburghii, Stocks ...	219
Banisteria bengalensis, Linn. ...	178
Bauhinia, Linn.	461
diphylla, Hamilt.	465
foveolata, Dalz.	464
Lawii, Benth.	464
malabarica, Roxb. ...	463
purpurea, Linn.	466
racemosa, Lam.	462
Vahlii, W. & A.	465
variegata, Linn.	466
Bergera Kœnigii, Dalz. ...	194
Bixa, Linn...	72
Orellana, Linn.	72
Bixaceæ	70
Bocagea, St. Hilaire... ...	32
Dalzellii, Hook. f. & T. ...	33
Bombax, L.	129
insigne, Wall.	132
malabaricum, DC. ...	130
Boswellia, Roxb.	215
serrata, Roxb.	215
thurifera, Roxb.	215
Brachypterum canarense, Dalz.	437
robustum, Dalz.	438
scandens, Dalz.	434
Buchanania, Roxb.	349
angustifolia, Roxb. ...	350
Lanzan, Spreng.	349
latifolia, Roxb.	349
Burseraceæ.	215
Butea, Roxb.	408
frondosa, Roxb.	409
parviflora, Dalz.	407
superba, Roxb.	411

C

	PAGE
Cadaba, Forsk.	49
farinosa, Forsk.	51
heterotricha, Stocks. ...	51
indica, Lamk.	50
Cæsalpinia. Linn.	439
Bonducella, Fleming. ...	439
coriaria, Willd.	443
cucculata, Roxb.	443
digyna, Grah.	446
mimosoides, Lam... ...	442
Nuga, Ait.	440
paniculata, Roxb... ...	440
Sappan, L.	443
sepiaria, Roxb.	440
Cajanus glandulosus, Dalz. ...	413
indicus, Spreng.	414
kulnensis, Dalz. .., ...	414
lineatus, Grah.	411
Calophyllum, Linn.	98
augustifolium, Dalz. ...	100
elatum, Bedd.	100
inophyllum, Linn.	99
spurium, Choisy	101
Wightianum, Wall... ...	101
Calysaccion longifolium, Wgt. ...	97
Canarium, Linn.	220
strictum, Roxb.	221
Canavalia, DC.	404
ensiformis, DC.	404
lineata, DC.	405
obtusifolia, DC.	405
Stocksii, Dalz.	405
virosa, Dalz.	404
Cansjera, Juss.	261
Rheedii, Gmel.	262
Capparidaceæ	48
Capparis, Linn.	51
aphylla, Roth.	57
brevispina, DC.	53
divaricata, Lamk.... ...	55
formosa, Dalz.	54
grandis, Linn.	59
Heyneana, Wall.	54
horrida, Linn.	62
longispina, Hook. f. ...	60
Moonii, Wgt.	58
Murrayana, Grah. ...	52

	PAGE
pedunculosa, Wall. ...	60
Roxburghii, DC.	58
sepiaria, Linn.	61
spinosa, Linn.	52
stylosa, DC.	55
tenera, Dalz.	63
zeylanica, Linn.	53
Carapa, Aubl.	244
moluccensis, Lam.... ...	245
obovata, Blume.	245
Cardiospermum Schmidelia, Dalz.	334
villosa, Dalz.	334
Cassia, Linn.	447
alata, Linn.	455
auriculata, Linn.	450
bicapsularis, Linn. ...	455
Fistula, Linn.	448
florida, Vahl.	454
glauca, Lam.	452
gœnsis, Dalz.	455
javanica, Spreng.... ...	455
lanceolata, W. & A. ...	455
marginata, Roxb.... ...	454
montana, Heyne..... ...	451
Roxburghii, DC.	454
siamea, Lam.	454
sumatrana, W. & A. ...	454
timoriensis, DC.	452
Cedrela, Linn.	248
Toona, Roxb.	249
Celastraceæ.	270
Celastrus, Linn.	276
montana, W. & A. ...	281
paniculata, Willd.... ...	276
Rothiana, Laws.	278
senegalensis, Lam. ...	281
verticellata, Roxb. ...	81
Chailletia sumatrana, Miq. ...	253
gelonioides, Hook. ...	253
Chailletiaceæ.	253
Chickrassia, Adr. Juss. ...	247
Nimmonii, Grah.	248
tabularis, Adr. Juss. ...	248
velutina, Roem.	248
Chloroxylon, DC.	250
Swietenia, DC.	250
Chukrassia tabularis, Adr. Juss.	248

C

	PAGE
Cipadessa, Blume.	227
fruticosa, Blume.	227
Cissampelos, Linn.	44
Pareira, Linn.	45
Cissus adnata, Roxb. ...	314
araneosa, Dalz.	320
auriculata, DC.	321
canarensis, Planch. ...	319
carnosa, Roxb.	317
cordata, Roxb.	308
discolor, Dalz.	309
edulis, Dalz.	308
elongata, Roxb.	320
gigantea, Planch.	311
muricata, Dalz.	324
pallida, Planch	309
pedata, Dalz.	323
quadrangularis, Linn. ...	308
repanda, Vahl.	312
repens, Lam.	308
retivenia, Planch.	324
setosa, Dalz.	317
tenuifolia, Planch. ...	322
trilobata, Lamk.	316
vitiginea, Roxb.	309
vitiginea, L.	314
Citrus, Linn.	203
Aurantium, Linn.	203
decumana, Linn.	203
medica, Linn.	203
Clausena, Burm.	194
indica, Oliv.	194
simplicifolia, Dalz. ...	190
Willdenovii, W. & A. ...	195
Clematis, L.	1
Gouriana, Roxb.	4
hedysarifolia, DC.	5
smilacifolia, Wall.	2
triloba, Heyne	3
Wightiana, Wall.	6
Cocculus, DC.	39
acuminatus, DC.	39
Leæba, DC.	42
macrocarpus, W. & A. ...	40
malabaricus, DC.	36
suberosus, DC.	37
villosus, DC.	41
Cochlospermum, Kunth ...	70
Gossypium, DC.	70
Colubrina, Rich.	303
asiatica, Brogn.	304
Commiphora Berryi, Engl. ...	220
Mukul, Engl.	219
Stocksiana, Cooke ...	220
Connaraceæ	367
Connarus, L.	369
monocarpus, Linn. ...	370
pinnatus, Lamk.	370
Ritchiei, Hook. f. ...	370
Wightii, Hook. f. ...	370
Cookia dulcis, Roxb. ...	195
Cratæva, L.	64
Nurvala, Ham.	64
religiosa, Forst.	64
Roxburghii, Br.	64
Crotalaria, Linn.	376
Burhia, Hamilt.	377
fulva, Roxb.	379
Heyneana, Grah.	378
juncea, L.	379
leptostachya, Benth. ...	379
Leschenaultii, Grah. ...	378
retusa, L.	378
sericea, Retz.	378
striata, DC.	380
tenuifolia, Roxb.	379
Cupania canescens, Pers. ...	332
Cyanospermum tomentosum, W. & A.	417
Cyclea, Arnott.	45
Burmanni, Miers. ...	46
peltata, Hook. f. & T. ...	47
Cylista, Ait.	415
scariosa, Ait.	415
Cyminosma pedunculata, DC. ...	190
Cynometra, Linn.	455
ramiflora, Linn.	455

D

	PAGE
Dalbergia, Linn. ...	... 422
acaciæfolia, Dalz. ...	... 428
confertiflora, Benth.	... 425
lanceolaria, Linn. ...	... 428
latifolia, Roxb. ...	... 423
Melanoxylon, Guill.	... 426
monosperma, Dalz.	... 426
Oojeinensis, Roxb.	... 390
paniculata, Roxb.	... 429
rubiginosa, Roxb.	... 425
Sissoo, Roxb. ...	... 422
spinosa, Roxb. ...	... 430
Stocksii, Benth. ...	... 426
sympathetica, Nimmo.	... 426
tamarindifolia, Roxb.	... 427
torta, Grah. ...	... 426
volubillis, Roxb. ...	... 429
Decaschistia, W. & A.	... 117
trilobata, Wgt. ...	... 118
Derris, Lour. ...	... 433
brevipes, Baker ...	... 436
canarensis, Baker ...	... 437
Heyneana, Benth.	... 436
oblonga, Benth. ...	... 438
platyptera, Baker	... 437
robusta, Benth. ...	... 438
scandens, Benth. ...	... 434
thyrsiflora, Talb. ...	... 437
uliginosa, Benth. ...	... 435
Wallichii, Prain ...	... 437
Desmodium, Desv.	... 392
Cephalotes, Wall....	... 393
congestum, Wall. ...	... 393
gangeticum, DC. ...	... 394
gyrans, DC. ...	... 396
latifolium, DC. ...	... 395
laxiflorum, DC. ...	... 394
polycarpum, DC. ...	... 396
pulchellum, Benth.	... 393
triquetrum, DC. ...	... 393
umbellatum, DC. ...	... 392
Dichrostachys, DC. ...	... 473
cinerea, W. & A. ...	... 473
Dillenia, Linn. ...	... 10
indica, Linn. ...	... 10
pentagyna, Roxb. ...	... 10
speciosa, Thunb. ...	... 10
Dilleniaceæ ...	... 9
Dipetalum biloculare, Dalz.	... 190
Dipterocarpaceæ ...	... 107
Dipterocarpus, Gærtn.	... 107
indicus, Bdd. ...	... 108
turbinatus. Gærtn.	... 108
Dodonæa, Linn. ...	... 342
Burmanniana, Dalz.	... 343
viscosa, Linn. ...	... 342
Dysoxylum, Blume ...	... 230
binectariferum, Hook. f.	... 231
glandulosum, Talb.	... 233
macrocarpum, Bedd.	... 231
malabaricum, Bedd.	... 233

E

Elæocarpus, Linn. ...	... 169
aristatus, Roxb. ...	... 175
Ganitrus, Roxb. ...	... 170
glandulifera, Hook. f.	... 175
oblongus, Gærtn. ...	... 172
serratus, L. ...	... 171
tuberculatus, Roxb.	... 173
Elæodendron, Jacq. f.	... 274
glaucum, Pers. ...	... 275
Roxburghii, W. & A.	... 275
Entada, Linn. ...	... 469
pusætha, DC. ...	... 470
scandens, Benth. ...	... 474
Epicharis exarillata, Arn.	... 231
Erinocarpus, Nimmo.	... 168
Nimmoanus, Grah.	... 168
Nimmonii, Grah. ...	... 168
Eriodendron, DC. ...	... 132
anfractuosum, DC.	... 133
Erioglossum, Blume ...	... 333
edule, Bl. ...	... 333
rubiginosum, Br. ...	... 333
Eriolæna, DC. ...	... 151
Candollei, Wall. ...	... 151
Hookeriana, W. & A.	... 151
quinqueloculare, Wgt.	... 151

E

	PAGE
Stocksii, Hook. f. & T. ...	151
Erythrina, Linn.	400
indica, Lam.	400
stricta, Roxb.	402
suberosa, Roxb.	402
Erythropalum, Bl.	259
populifolium, Mast. ...	259
Erythroxylon monogynum, Roxb.	177
Euonymus, Linn.	271
Goughii, Wgt.	271
indicus, Heyne	271
sp. Bedd.	224
Euphoria Longana, Lamk. ...	339
Eurya, Thunb.	105
japonica, Thunb.	105
Evodia, Forst.	185
Roxburghiana, Benth. ...	185
triphylla, Bedd.	185

F

Feronia, Gærtn.	203
Elephantum, Correa ...	204
Flacourtia, Commers. ...	74
Cataphracta, Roxb. ...	78
montana, Grah.	76
Ramontchi, L'Herit. ...	76
sapida, Roxb.	76
sepiaria, Roxb.	78
Flemingia, Roxb.	417
bracteata, Wight. ...	418
congesta, Roxb.	420
involucrata, Benth. ...	421
lineata, Roxb.	418
nana, Roxb.	419
semialata, Wall.	421
sericans, ...	420
strobilifera, R. Br. ...	418
tuberosa, Dalz.	421
Wallichii, Wight	420

G

Gærtnera racemosa, Roxb. ...	178
Garcinia, Linn.	89
Cambogia. Desr.	91
indica, Chois.	90
malabarica, Talb. ...	96
Morella, Desr.	93
ovalifolia, Hook. f. ...	95
ovalifolius, Hook. f. ...	96
pictoria, Roxb.	93
purpurea, Roxb.	90
spicata, Hook. f.	95
spicata, Kz.	96
Xanthochymus, H. f. ...	94
Garuga, Roxb.	217
pinnata, Roxb.	217
Geraniaceæ	183
Glycosmis, Correa.	191
pentaphylla, Corr. ...	191
Glycycarpus racemosus, Dalz. ...	360
Gomphandra, Wall. ...	263
axillaris, Wall.	263
Gomphia, Schreb.	213
angustifolia, Vahl. ...	214
Goniothalamus, Blume ...	25
cardiopetalus, H f. & T. ...	25
Gordonia, Ellis.	106
obtusa, Wall.	106
Gossypium, L.	126
arboreum, Linn.	126
barbadense, Linn. ...	126
herbaceum, L.	126
Stocksii, Mast.	126
Gouania, Linn.	304
leptostachya, Dalz. ...	304
microcarpa, DC.	304
Grewia, Linn.	154
abutilifolia, Juss.	165
asiatica, Linn.	162
aspera, Roxb.	165
capitata, Dalz.	155
carpinifolia, Wall. ...	157
columnaris, Sm.	157
excelsa, Vahl.	160
heterotricha, Mast. ...	155

G

	PAGE
hirsuta, Vahl.	166
lævigata, Vahl.	164
lancæfolia, G.	166
leptopetala, Brandis ...	160
Microcos, Linn.	168
orbiculata, Rottl.	160
orientalis, Linn.	157
pilosa, Lam.	162
polygama, Roxb.	166
populifolia, Vahl.	158
Ritchiei, Mast.	155
rotundifolia, Juss. ...	160
salvifolia, Heyne	159
tiliæfolia, Vahl.	160
umbellifera, Bedd. ...	157
villosa, Willd.	163
Guarea binectarifera, Roxb. ...	231
Guatteria cerasoides, W. & A.	24
fragrans, Dalz.	23
Korinti, Dunal	24
laurifolia, Grah.	33
longifolia, Wall.	22
sempervirens, Dunal. ...	24
suberosa, DC.	24
Guilandina Bonduc, Dalz. ...	439
Bonducella, Linn.	439
Guttiferæ	89
Gymnosporia, W. & A. ...	277
emarginata, Grah. ...	278
konkanensis, Talb. ...	280
montana, Roxb.	281
puberula, Laws.	277
Rothiana, W. & A. ...	278

H

Hardwickia, Roxb.	456
binata, Roxb.	456
Harpullia, Roxb.	340
cupanioides, Hiern. ...	340
imbricata, Thw.	340
Helicteres, Linn.	146
Isora, Linn.	146
Hemigyrosa, Blume ...	331
canescens, Thw. ...	332
Heritiera, Ait.	144
littoralis, Dryand	145
minor, ...	145
Heynea, Roxb.	242
affinis, Juss.	242
trijuga, Roxb.	242
Hibiscus, Medik	119
collinus, Roxb.	120
furcatus, Roxb.	119
hirtus, Linn.	122
tetraphyllus, Roxb. ...	123
tiliaceous, Linn.	121
Warreensis, Dalz. ...	123
Hippocratea, Linn.	282
Grahami, Wight	283
indica, Willd.	285
obtusifolia, Roxb. ...	282
Hiptage, Gærtn.	178
Madablota, Gærtn. ...	178
Hiræa indica, Roxb. ...	180
Holigarna, Ham.	356
Arnottiana, Hook. f. ...	357
ferruginea, March. ...	358
Grahamii, Hook. f. ...	359
longifolia, Roxb.	357
Hopea, Roxb.	111
Wightiana, Wall.	111
Hugonia, L.	176
Mystax, Linn.	176
Hydnocarpus, Gærtn. ...	79
Wightiana, Blume... ...	79

I

Ilex, L.	268
malabarica, Bedd. ...	269
Wightiana, Dalz. ...	269
Ilicaceæ	268
Indigofera, Linn.	380
argentea, Linn.	381
cærulea, Roxb.	381
constricta, Trim.	381
flaccida, Thw.	381
Houer, Forsk.	381

I

	PAGE		PAGE
paucifolia, Delile ...	... 380	*sumatrana*, Gærtn.	... 381
pulchella, Roxb. ...	... 382	tinctoria, Linn. ...	... 381

J

Jonesia Asoca, Roxb. ... 458

K

Kleinhovia, Linn. ...	... 145	Kydia, Roxb. ...	... 127
Hospita, Linn. ...	... 145	calycina, Roxb. ...	... 127

L

Lansium, Rumph. ...	... 236	Talboti, King ...	... 329
anamallayanum, Bedd.	... 237	Leguminosæ ...	... 372
Leea, Linn. ...	... 326	Lepionurus ...	... 261
æquata, Linn. ...	... 330	Leucæna, Benth. ...	... 474
aspera, Wall. ...	... 327	glauca, Benth. ...	... 474
cinerea, Laws. ...	... 330	Limonia, Linn. ...	... 198
coriacea, Laws. ...	... 330	acidissima, Linn. ...	... 198
crispa, Willd. ...	... 327	*oligandra*, Dalz. ...	... 189
diffusa, Laws. ...	... 330	Lineæ	... 176
hirta, Roxb. ...	... 330	*Linum usitatissimum*, L.	... 176
latifolia, Wall. ...	... 330	Lophopetalum, Wight	... 272
macrophylla, Roxb.	... 326	Wightianum, Arn.	... 273
robusta, Roxb. ...	... 330	Luvunga, Hamilt. ...	... 196
sambucina, Willd. ...	... 327	eleutherandra, Dalz.	... 196
setuligera, C. B. C.	... 330	*scandens*, Ham. ...	... 197
Staphylea, Roxb. ...	... 327		

M

Mærua, Forsk. ...	... 48	Melia, Linn.	... 225
arenaria, H. f. & T.,	... 48	*Azadirachta*, Linn.	... 228
ovalifolia, Cambess.	... 48	Azedarach, Linn.	... 226
Magnoliaceæ ...	... 12	*composita*, Dalz. ...	... 226
Mallea Rothii, Adr. Juss.	... 227	dubia, Cav. ...	... 226
Malpighiaceæ ...	... 178	*indica*, Brandis ...	... 228
Malvaceæ	... 117	*sempervirens*, Sw. ...	... 226
Mangifera, Linn. ...	... 348	Meliaceæ	... 223
indica, Linn. ...	... 348	Meliosma, Blume. ...	... 345
Mappia, Jacq. ...	... 266	*pungens*, Wall. ...	... 345
fœtida, Miers ...	... 267	Wightii, Planch. ...	... 345
oblonga, Miers ...	.. 267	Menispermaceæ ...	... 35
ovata, Miers ...	... 267	*Menispermum Cocculus*, L.	... 37
tomentosa, Miers ...	... 267	Mesua, L.	... 102

M

	PAGE
coromandelina, Bedd. ...	102
ferrea, Linn.	102
pulchella, Planch. ...	102
Roxburghii, Wgt. ...	102
sclerophylla, Thw.... ...	102
speciosa, Choisy	102
Mezoneuron, Desf.	443
cucullatum, W. & A. ...	443
Michelia, Linn.	12
Champaca, Linn.	13
Microtropis, Wall.	272
latifolia, Wight	272
microcarpa, Wight ...	272
Millettia, Wgt.	383
racemosa, Benth.	383
Milnea Roxburghiana, Wgt. ...	234
Mimosa, Linn.	475
hamata, Willd.	476
polyancistra, Benth. ...	477
pudica, Linn.	475
rubicaulis, Lam.	476
Moacurra gelonioides, Roxb. ...	253
Monocera tuberculata, W. & A.	173
Moringa, Lamk.	364
concanensis, Nimmo. ...	365
pterygosperma, Gærtn. ...	364
Moringaceæ	364
Mucuna, Adans.	398
atropurpurea, DC. ...	400
gigantea, DC.	400
monosperma, DC. ..	398
pruriens, DC.	399
prurita, Dalz.	399
Mundulea, DC.	385
suberosa, Benth.	385
Murraya, Linn.	192
exotica, Linn.	193
Kœnigii, Spreng.	193
paniculata, Jack.	193
Myricaria	88
Myristica attenuata, Wall. ...	371

N

Naravelia, DC.	7
zeylanica, DC.	7
Neerija dichotoma, Roxb. ...	275
Nemedra Nimmonii, Dalz. ...	239
Nephelium, Linn.	338
Litchi, Camb.	340
Longana, Camb.	338
Niebhuria oblongifolia, DC. ...	48
Nothopegia, Blume	360
Colebrookiana, Blume ...	360

O

Ochna, L.	212
nana, Hamilt.	213
pumila, Buch-Ham. ...	213
squarrosa, L.	212
Ochnaceæ	212
Ochradenus, Delile	67
baccatus, Del.	67
Ochrocarpus, Thouars ...	97
longifolius, Benth.... ...	97
Odina, Roxb.	353
Wodier, Roxb.	353
Olax, Linn.	256
nana, Wall.	259
scandens, Roxb.	257
Wightiana, Wall.	257
Orophea, Blume	31
zeylanica, H. f. & T. ...	31
Ougeinia, Benth.	390
dalbergioides, Benth. ...	390
Oxymitra	25

P

Paramigyna, Wgt.	199
monophylla, Wgt.... ...	199
Paritium tiliaceous, W. & A. ...	121
Parkinsonia, Linn.	445
aculeata, Linn.	445
Phoberus crenatus, W. & A. ...	73

P

	PAGE
Piptostylis indica, Dalz.	194
Pithecolobium, Mart.	501
bigeminum, Benth.	501
dulce, Benth.	502
Saman, L.	503
Pittosporaceæ	81
Pittosporum, Banks	81
dasycaulon, Miquel	82
floribundum, W. & A.	81
Platea axillaris, Dalz.	263
Pleurostylia, Wight	274
Wightii, W. & A.	274
Poinciana, Linn.	444
elata, Linn.	444
regia, Bojer	444
Polyalthia, Blume	21
cardiopetala, Dalz.	25
cerasoides, Benth.	24
coffeoides, Benth.	23
fragrans, Benth.	23
Korinti, Benth.	24
longifolia, Benth.	22
suberosa, Benth.	24
Wynaadensis, Bedd.	25
Pongamia, Vent	432
glabra, Vent	432
paniculata, Wight	436
Prosopis, Linn.	471
spicigera, Linn.	472
Stephaniana, Kunth.	473
Pterocarpus, Linn.	430
Marsupium, Roxb.	431
Pterospermum, Schreb.	147
acerifolium, Willd.	149
Heyneanum, Wall.	150
Lawianum, Nimmo.	150
reticulatum, W. & A.	150
suberifolium, Lam.	148
Pueraria, DC.	405
tuberosa, DC.	405
Pygeum, Gærtn.	405
acuminatum, Grah.	405
Gardneri, Hook. f.	405
zeylanicum, Dalz.	405

R

Ranunculaceæ.	1
Reinwardtia trigyna, Planch.	177
Reseda odorata, L.	67
Resedaceæ.	67
Rhamnaceæ.	289
Rhamnus, L.	300
triqueter, Wall.	300
Wightii, W. & A.	300
Rhus, Linn.	547
mysorensis, Heyne	347
Rosaceæ	504
Rourea, Aubl.	367
Prainiana, Talb.	368
santaloides, W. & A.	367
Rubus, Linn.	506
ellipticus, Smith	507
flavus, Brandis	507
lasiocarpus, Smith	507
moluccanus, Linn.	506
rugosus, Smith	506
Wallichianus, Dalz.	507
Rutaceæ.	184
Rhynchosia, Lour.	416
cyanosperma, Benth.	417

S

Sabiaceæ	345
Saccopetalum, Benn.	30
tomentosum, H. f. & T.	31
Sageræa, Dalz.	32
Dalzellii, Bedd.	33
laurina, Dalz.	33
Sageratia, Brogn.	302
oppositifolia, Brogn.	302
Salacia, Linn.	285
Brunoniana, W. & A.	288
macrosperma, Wight.	286
oblonga, Wall.	287
prinoides, DC.	286
Roxburghii, Wall.	288

S

	PAGE
Salmalia malabarica, Schott.	130
Samadera, Gærtn.	210
indica, Gærtn.	210
Sapindaceæ	331
Sapindus, Linn.	336
emarginata, Roxb. ...	337
laurifolius, Vahl.	337
rubiginosa, Roxb. ...	333
trifoliatus, Linn. ...	337
Saraca, Linn.	457
indica, Linn.	457
Sarcostigma, W. & A. ...	265
Kleinii, W. & A. ...	265
Schleichera, Willd. ...	335
trijuga, Willd.	335
Schmidelia Cobbe, Grah. ...	334
Sclerostylis atalantioides, Wgt.	201
Scolopia, Schreber. ...	73
crenata, Clos.	73
Scutia, Comm.	301
indica, Brogn.	302
Semecarpus, Linn. F. ...	355
Anacardum, Linn. f. ...	355
cuneifolia, Roxb. ...	356
Grahamii, Dalz.	359
Senna officinalis, Roxb. ...	455
speciosa, Roxb.	453
Sesbania, Pers.	386
ægyptiaca, Pers. ...	387
grandiflora, Pers. ...	388
Shorea, Roxb.	109
laccifera, Heyne	110
Talura, Roxb.	110
Simarubeæ.	207
Solenocarpus, Wgt. & Arn. ...	352
indica, Wgt. & Arn. ...	352
Sophora, Linn.	438
heptaphylla, Wight. ...	439
Wightii, Baker	439
Soymida, Adr. Juss. ...	245
febrifuga, Adr. Juss. ...	245
Spatholobus, Hassk. ...	407
purpureus, Benth. ...	408
Roxburghii, Benth. ...	407
Sphærocarya leprosa, Dalz. ...	260
Spondias, Linn.	361
acuminata, Roxb. ...	362
mangifera, Willd. ...	362
Stemonurus fœtidus, Wgt. ...	267
Stephania, Lour.	43
hernandifolia, Walp. ...	44
Sterculia, Linn.	135
alata, Roxb.	142
colorata, Roxb.	140
fœtida, Linn.	136
guttata, Roxb.	139
Haynii, Bedd.	142
urens, Roxb.	137
villosa, Roxb.	138
Sterculiaceæ	135
Strombosia, Blume	260
ceylanica, Gardn.	261
leprosa, Talb.	260
Stylosanthes, Sw.	389
mucronata, Willd. ...	389

T

Tamaricaceæ	84
Tamarindus, Linn.	459
indica, Linn.	459
Tamarix, Linn.	84
articulata, Vahl.	86
dioica, Roxb.	85
ericoides, Rottl.	87
gallica, Linn.	84
stricta, Boiss.	88
Taverniera, DC.	388
cuneifolia, Arn.	388
nummularia, DC.	388
Tephrosia, Pers.	385
purpurea, Pers.	385
suberosa, Dalz.	385
Ternstrœmiaceæ	105
Tetrastigma lanceolarium, Planch.	324
Thespesia, Corr.	123
Lampas, Dalz.	124
macrophylla, Blume ...	124
populnea, Corr.	125
Tiliaceæ	154

T

	PAGE		PAGE
Tiliacora, Coleb.	39	Triphasia, Lour.	343
racemosa, Coleb.	39	*Aurantiola*, Lour. ...	198
Tinospora, Miers	36	trifoliata. DC.	198
cordifolia, Miers	36	Turpinia, Vent.	343
malabarica, Miers... ...	36	*nepalensis*, Bedd. ...	343
Toddalia, Juss.	188	pomifera, DC.	343
aculeata, Pers.	189	Turræa, Linn.	224
bilocularis, W. & A. ...	190	villosa, Benn.	224
Trichaurus ericoides, W. & A.	87	*virens*, Linn.	224

U

Unona, L.	18	Unoneæ	33
discolor, Vahl.	19	Uvaria, L.	15
Dunalii, H. f. & T. ...	20	Hookeri, King	16
farinosa, Dalz.	19	*lurida*, Dalz.	15
Lawii, H. f. & T.	20	Narum, Wall.	15
pannosa, Dalz.	19	Uvarieæ	33

V

		indica, Linn.	316
Vachellia Farnesiana, W. & A.	479	*japonica*, Thunb. ...	323
Vateria, L.	113	lanceolaria, Roxb. ...	324
indica, L.	113	latifolia, Roxb.	315
malabarica, Blume ...	113	Linnæi, Wall.	314
Ventilago, Gærtn.	289	*mollis*, Wall.	323
bombaiensis. Dalz. ...	293	pallida, W. & A.	309
calyculata, Tulasne ...	292	pedata, Vahl.	323
madraspatana, Gærtn. ...	290	quadrangularis, Wall. ...	308
Violaceæ	68	repanda, W. & A. ...	312
Vitis, Linn.	306	repens, W. & A.	308
adnata, Roxb.	314	reticulata, Thw.	324
araneosa, Laws.	320	Rheedii, W. & A. ...	316
auriculata. Roxb.	321	setosa, Wall.	317
canarensis. Dalz.	319	*sp.* aff. *V. elongata*, Wall. ...	321
carnosa, Wall.	317	tenuifolia, W. & A. ...	322
discolor, Dalz.	309	tomentosa, Heyne ...	314
elongata, Wall.	320	*triloba*, Heyne	314
gigantea, Bedd.	311	vinifera, Linn.	316
glauca, W. & A.	310	*Woodrowii*, Stapf. ...	309

W.

Wagatea, Dalz.	446	piscidia, Roxb.	241
spicata, Dalz.	446	*Wisteria pallida*, Dalz.	383
Walsura, Roxb.	241	*racemosa*, Dalz.	383

X

	PAGE
Xanthochymus ovalifolius, Roxb.	95
pictorius, Roxb.	94
Xanthoxylon triphyllum, Dalz.	185
Ximenia, Linn.	256
americana, Willd. ...	256
Xylia, Benth.	467
dolabriformis, Benth. ...	468

Z

	PAGE
Zanthoxylum, Linn. ...	186
ovalifolium, Wgt. ...	187
Rhetsa, DC.	188
Zizyphus, DC.	293
Caracutta, Roxb. ...	298
glabrata, Heyne	295
horrida, Roth.	300
Jujuba, Lamk.	294
nummularia, W. & A. ...	296
Œnoplia, Mill.	296
rotundifolia, Lamk. ...	296
rugosa, Lamk.	298
trinervia, Roxb.	295
xylopyra, Willd.	298

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